Better Crops WITH PLANT FOOD

March 1936 10 Cents

The Pocket Book of Agriculture

Aerial view of hoist and grinding plant at the U. S. Potash Company's mine near Carlsbad, N. M.

BETTER CROPS WITH POTASH

Every pound of Potash that goes into the soil to enrich our agricultural products helps to raise our standards of health for it is a simple truth that there is a definite relation between health and soil fertilization. Lands adequately fertilized with the proper fertilizer produce foods which build and maintain healthy bodies. Cotton, tobacco, corn, wheat and potato crops are benefited by Potash. Fruits and vegetables are richer in food value and tend to keep better because of this important plant food.

MURIATE OF POTASH

50% and 62½% K_2O

MANURE SALTS

Approximately 30% K_2O

UNITED STATES POTASH COMPANY, INC.

342 Madison Avenue **New York, N. Y.**

SUNSHINE STATE POTASH U.S.A. PRODUCT OF NEW MEXICO U.S.

REG. U. S. PAT. OFF.

Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

Editorial Offices: Investment Bldg., Washington, D. C.

VOLUME XX NUMBER SEVEN

TABLE OF CONTENTS, MARCH, 1936

Richer Dirt 3
Everywhere in 1936, Says Jeff

Soybean Trends 6
Show Need of Balancing Soil Bank Account, According to Geo. L. Schuster

Fertilizing Pennsylvania Cigar-Leaf Tobacco 9
D. E. Haley Describes Its Success in Lancaster County

Fertilize to Control Cotton Wilt and Rust 13
Is V. H. Young's Sound Advice

Meeting New Hampshire's Pasture Problem 17
Ford S. Prince Gives the Solution

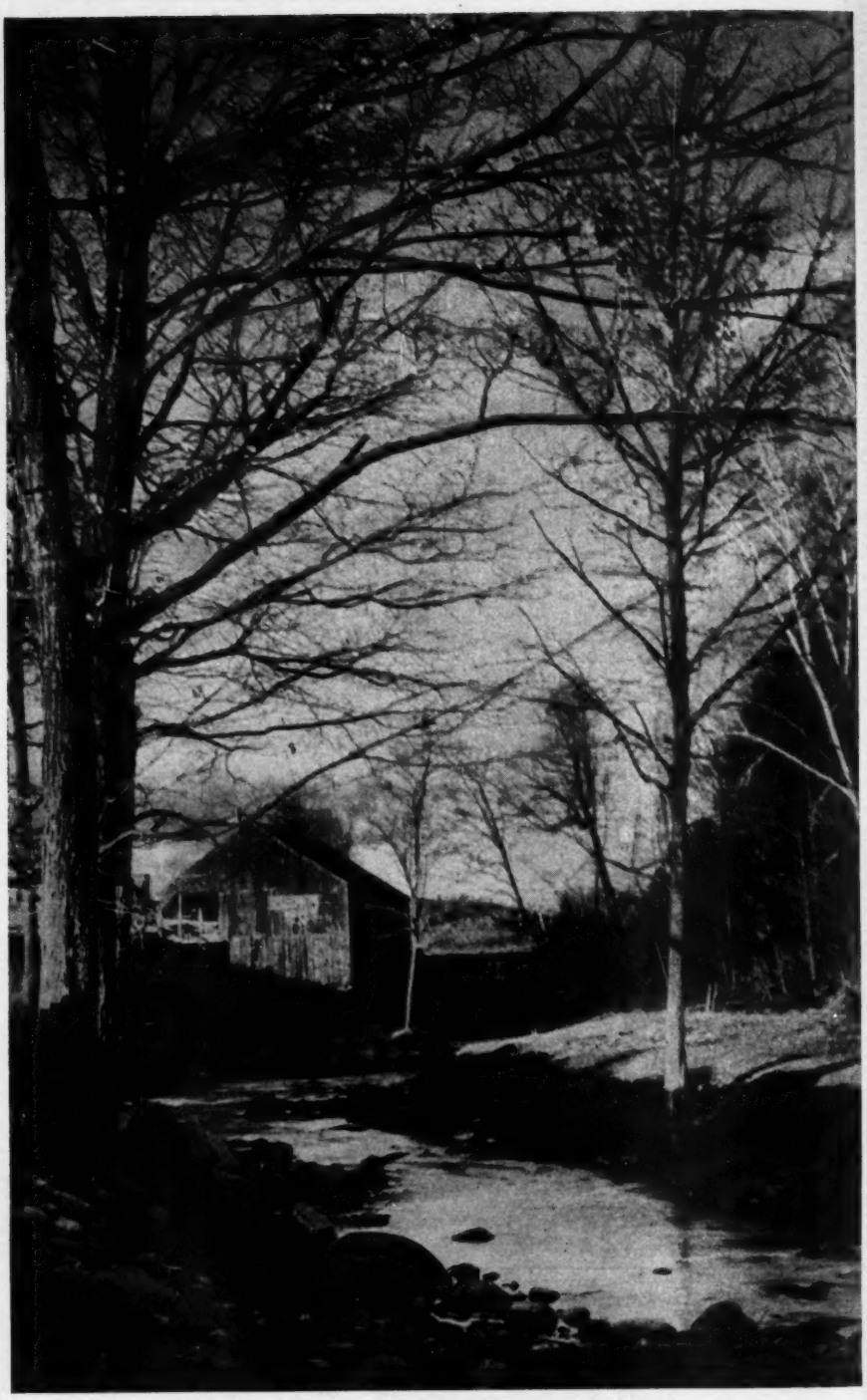
The Inquiring Mind and the Seeing Eye 20
A. B. Alexander Describes the Importance of Dr. G. S. Fraps to American Agriculture

Editorials 27

Reviews 29

American Potash Institute, Inc.
Investment Building, Washington, D. C.

J. W. TURRENTINE, *President and Treasurer*
G. J. CALLISTER, *Vice-President and Secretary*



SPRING THAW—AND THE OLD MILL RUNS AGAIN.

Better Crops with PLANT FOOD

PUBLISHED MONTHLY FOR THE AMERICAN POTASH INSTITUTE, INC., INVESTMENT BUILDING, WASHINGTON, D. C. SUBSCRIPTION, $1.00 FOR 12 ISSUES; 10c PER COPY. COPYRIGHT, 1936, BY THE BETTER CROPS PUBLISHING CORPORATION.

VOL. XX WASHINGTON, D. C., MARCH, 1936 No. 7

Jeff says, 1936 will bring - - -

Richer Dirt

Jeff McDermid

WE have no difficulty getting more and richer dirt into our novels, pulp magazines, and dramas, but the job of obtaining a higher assay of pep and organic matter into our land (where it belongs) seems to require an act of Congress and the sacrifice of several articles of the Constitution.

Now, during the preliminary bouts, both political parties have agreed that first-class dirt is essential to success in 1936 on any agricultural front. Party leaders on all fronts are not averse. I hasten to explain that I refer to dirt in the sense of "soil" or geological residues. It is a manifestation of the return to simple fundamentals.

We have long heard the plea from classrooms and scientific sources that "the soil is the basis of agricultural regeneration," but nobody paid much heed to it when they laid the forms and poured the concrete of former party platforms. Mostly, they used gravel and sand to make up the "mud" for the political mix, so it would throw good. But everybody concedes that you can't grow crops or ideas on either. The former is too coarse, and the latter is better for glass-making than grass-making. But after the recent judicial fiat, they demanded something else to try at. And if you are

looking for something reliable to stand on, earth is the natural consequence.

To date, the only criticism of soil as the catchword for 1936 comes from a solon who thinks it will not catch votes quite as neatly as "higher farm prices" might; but those with a livid eye glued to the consumers' gallery are inclined to feel that soil is relatively harmless compared to the buzz-saw of sky-high sausage and de luxe board bills. They shy away from tacking higher incomes on the R. F. D. right to the grocery bills of the proletariat. They claim with pretty good sense that it was bad psychology and maybe a durn-sight worse politics. So the soil inherits the limelight.

The court crimped the farm program on general welfare and federal authority angles. Here the good old soil returns to its heritage. Few will deny that plenty of fresh dirt connects every state in the Union as one "indivisible entity," and/or holds us together as a nation. It was there before the rivers and lakes, and expects to remain there when they dry up, as Kansas can testify.

Soil is far safer to adopt as a bond of common necessity than water, because many of us get along very well without any water, and you can't bet on water anyhow like you can on good, old reliable hard-pan or shale.

AS a constitutional bulwark, hunt me up anything harder than my garden after a drought, or anything more tenacious than the South Dakota gumbo. Furthermore, it can be proved that half of the surface soil of western Iowa used to be at home somewhere in wind-blown Nebraska, while the old Mississippi takes tons of Lake State granules to Louisiana and beyond. This again clinches the interstate commerce clause on the side of the salvationists.

So probably the best the scuttled mariners can do is to leave the old hulk and get aboard the flagship Soil Saver, run by Cap Bennett, limber up the guns, and get going. Of course, I presume that his first concern is that the new crew might go in for conversation rather than conservation. I suspect that the admiral is also rather worried over the extra supercargo he may have to adopt. He hadn't sent out any life boats to collect the domestic allotment sailors when this was penned. But like all able navigators, he has to wait for orders.

THEN again, it might be better not to overload the soil barge in its dredging operations. The barkantine Resettlement is a new ship which has not come near the shoals yet or spent much time flirting with the sirens. The difference between soil conservation programs and those of resettlement is chiefly that the former tries to keep land from moving, while the latter wants to help farmers to keep moving. (Personally, I opine that we have some land and some would-be farmers which could be moved right off the hemisphere without much loss.)

Speaking of moving reminds me of a new farm plan hatched by a city friend of mine who once drove into the country for some fresh air. Without long prejudice or agrarian affiliations, he faced the problem more freely than most of us. It was plain to him what should be done. I think he wrote his congressman about it, and I anticipate seeing it spread out on the dull pages of the Record one of these days. His hunch was to send half of the southern cotton planters north to milk cows where the lactic juice freezes solid before it hits the pail, and then send the northern dairymen to Alabama to hold down the surplus adjacent to the gins. After a year or so of this mutual exchange, each faction would return home to manage what's left, wiser in geography and more content with native conditions. "Give them non-transferable transportation benefits instead of cash," my friend concluded, "and the rush of

business will solve the bus and railroad problem at the same time."

Over in England when a reorganization committee deliberates on a farm problem, they are very frank about calling the result of their cogitations a "scheme." They have hops schemes, potato schemes, milk schemes, and chicken schemes, and every one of them thus far has survived our more dignified "programs." It may not be

that our plans were of a kind to court disaster, although they met disaster in the courts. Yet most of us agree that there are some inherent factors in our economy these days which present even stiffer obstacles to success than the courts.

We can't amend ourselves out of peculiar situations by a few wordy law documents, even if they bear the seal of the highest tribunal. At least two variable and vexing things intervene to mar the perfect outcome—weather and human perversity. A vehemently versatile vocabulary is our only saving grace when coping with them, although they may be a blessing in disguise, as we shall mention later.

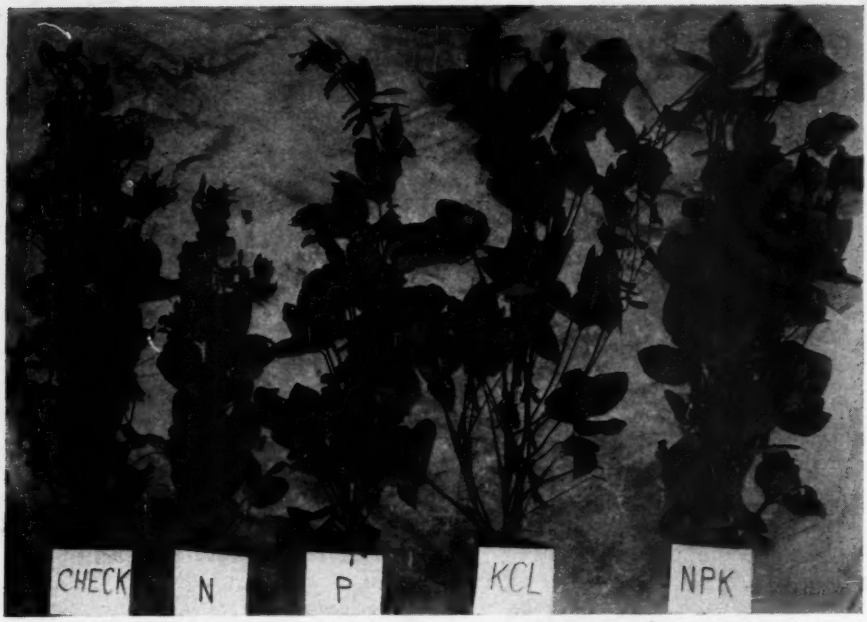
Arriving finally at my text, it is simply that our major trouble is *to make known efficiency safe for agricultural practice.* Apply it to the new substitute farm program, and then see if I care whether you discredit my brief or not. It won't make much difference anyhow, for I intend to root for soil salvation all through the revival, whether there are any cash converts or not. Coming as I do from a farm where you either got your pants lined with sandburrs or your boots caked with muck, I am for applying everything in the w. k. "fertilizer triangle," and plowing under everything that won't get us cost of perspiration. Then, in a pinch, if all else fails, they can set up a synthetic food factory in every Ford salesroom and thus save us plenty of conventions, calculations, compound interest, and muscle grunts.

But to resume where I disconnected: Perhaps I state the case too simply by saying that we face the challenge of making agriculture a safe field for practices which we have proven to be worthy of wholesale adoption. That's the direction we took when the experiment stations were started, and again later, when our extension forces took those laboratory seeds out to broadcast among the "heather and the heathen." It's not new. It's old stuff —to the minority. The minority, I mean, who profited by these lessons—the fellows who came to winter short courses with chilblains and frosted beaks, and endured long lectures for the soil's sake, and their own success.

AS long as we faced unlimited world trade and overseas export, efficiency had a chance. The minority who used better farm management systems were the husky "specimen patients" exhibited with modest pride by the college clinics in agricultural progress. They found that it paid to be pushers and comers. Knowledge was power indeed!

But now we have gradually increased the efficiency of this minority so that they are doing the major share of food production at whatever "profit" there is left. Meanwhile, our

(*Turn to page* 44)



Typical soybean plants grown on the fertility plots of the Delaware Agricultural Experiment Station.

Soybean Trends

By Geo. L. Schuster

Agronomist, University of Delaware

SOYBEANS, a crop introduced from the Orient, are now one of the major crops in the eastern United States. There were not more than eight varieties grown in the United States prior to 1898. Since then more than 1,000 selections and varieties have been tested, and about 50 varieties are listed by seedsmen. Approximately 3,500,000 acres are seeded annually, at the present time, of which 2,250,000 acres are utilized for hay and 1,250,000 acres are harvested for seed. The area harvested for seed produces almost 19,000,000 bushels.

This crop, first introduced as a curiosity and later grown as a soil improver and forage crop, is now utilized in the manufacturing field. About one fourth of the soybean seed now harvested, yielding approximately 15,000,000 pounds of oil annually, enters manufacturing channels. The products manufactured from soybean oil and meal are numerous—too numerous to mention here. Let it suffice to say that the soybean has passed through the curiosity and experimental stage of adaptation to American agriculture and has now become one of our important cash crops for the farmer in the eastern United States.

When a farm crop passes from the role of a green manure crop or a forage crop to that of a cash crop, it usually means that at least a part of the crop is removed from the soil and never finds its way back unless it is by the way of manurial applications or a return of the straw to the land where the seed only is harvested. Smith * has calculated that a yield of 5,860 pounds of soybean hay will return to the soil in the hay and roots combined 150 pounds of nitrogen, 27 pounds of phosphoric acid, and 100 pounds of potash. Wood † states that an acre of soybeans producing 9½ tons (green weight) will return to the soil 165 pounds of nitrogen, 42 pounds of phosphoric acid, and 109 pounds of potash in the crop; and an additional 9 pounds of nitrogen, 2 pounds of phosphoric acid, and 6 pounds of potash in the roots.

These observations indicate that the removal of a crop of soybeans from the land is taking with it about 150 pounds of nitrogen, 40 pounds of phosphoric acid, and 100 pounds of potash from each acre. Probably two thirds of the nitrogen removed has been derived from the air. This still leaves 50 pounds of nitrogen and the phosphoric acid and potash to be taken from the soil when the crop is removed. The amount of plant food removed will depend upon a number of factors, such as crop growth and the available plant food.

Soil Bookkeeping

Transposing the amount of plant food removed by the harvest of an acre of soybeans into terms of the amount of fertilizer or manure required to replace this loss, one will find that it requires approximately 7 or 8 tons of manure or a fertilizer mixture containing 300 pounds of 16 per cent nitrate of soda, 200 pounds of 20 per cent superphosphate, and 200 pounds of 50 per cent muriate of potash. Soil bookkeeping will not be one of exactly balancing the debits and credits, but the soil must be looked upon as a medium of exchange where the income and outgo of plant food is about equal if crop production is not to decrease. Perhaps it does not require 7 tons of manure or 700 pounds of a 7-6-14 fertilizer to replace the plant food removed by harvesting an acre of soybeans, but at any rate some plant food has been removed and it should be replaced if the fertility level and crop yields are to be maintained.

Don't Use Reserves

Soybeans have been grown at the Delaware Experimental Farm * since 1912 in a rotation of corn, soybeans, wheat, and hay (clover and timothy). The hay crop was not fertilized. The other crops were fertilized as follows:

1912-1924 (lbs. per acre)

Plot	Total per Rotation	On Soybeans	Fertilizer
4	270	75	Muriate of potash
7	750	250	Superphosphate
	270	75	Muriate of potash
9	350	100	Nitrate of soda
	750	250	Superphosphate
	270	75	Muriate of potash
15	25 Tons	5 Tons	Manure

1925-1932

4	90	18	Muriate of potash
7	375	75	Superphosphate
	90	18	Muriate of potash
9	38	8	Nitrate of soda
	38	8	Dried blood
	375	75	Superphosphate
	90	18	Muriate of potash
15	10 Tons	..	Manure

The average annual yields of soybeans for the 21-year period were as follows:

* Smith, C. D., Mich. Agr. Exp. Station, Bul. 227.

† Woods, C. D., Conn. Agr. Exp. Station, (Storrs) Bul. 6.

* Delaware Exp. Station Bulletins 137, 162 and 192.

Treatment	Yield bu. per A.
No fertilizer	12.3
Muriate of potash	15.6
Superphosphate, Muriate of potash	21.3
Nitrate of soda, Superphosphate, Muriate of potash	23.3
Manure	24.7

There has been an increase in yield on the fertilized and manured plots over the untreated plots for the period under consideration, but what has been the trend of these yields during this period? Have the yields from the untreated plots gone up or down or remained about the same? Have the yields from the treated plots remained about the same throughout the period? If the 21-year period is broken down

(*Turn to page* 43)

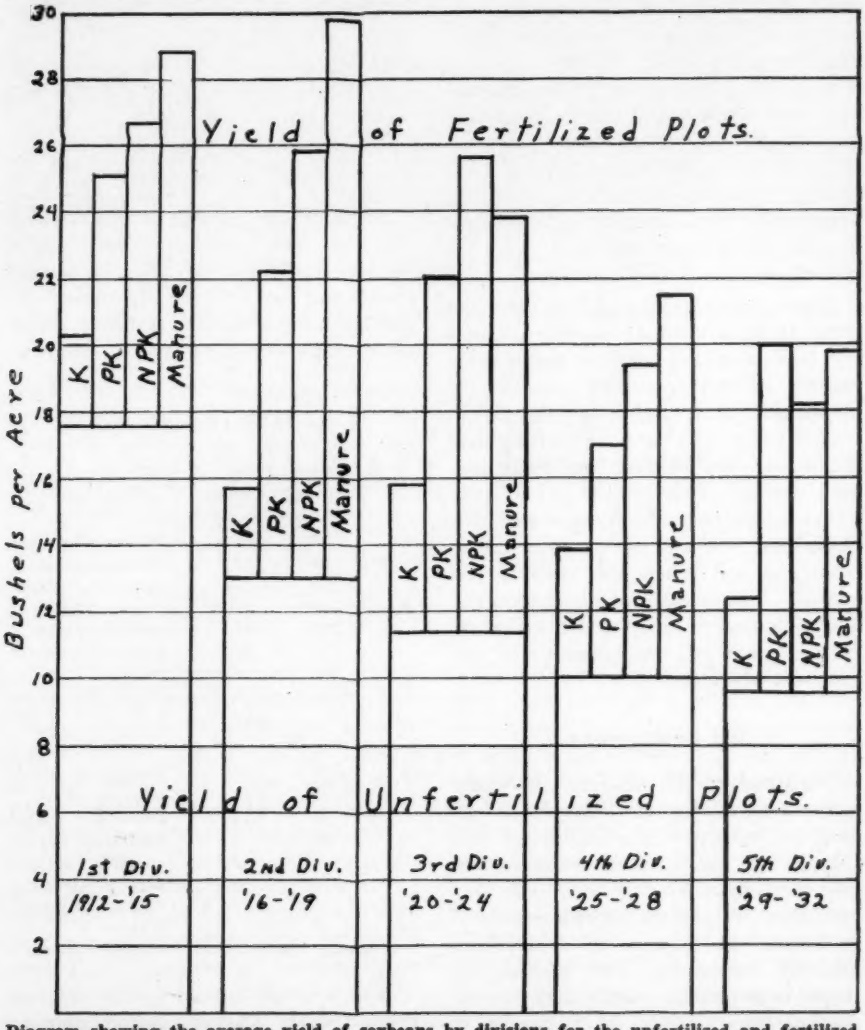


Diagram showing the average yield of soybeans by divisions for the unfertilized and fertilized plots, 1912-1932 inclusive. The trend of the yields for the unfertilized plots is downward. The trend of the yields of the fertilized plots is also downward until the highest yield from fertilizer treatment in the 5th divisions (1929-1932) was only 2 bushels above the unfertilized plot of the first division, 1912-1915. This indicates that there has not been sufficient plant-food material returned to the soil to sustain the original crop-producing power of the soil.

Tobacco plots of the three-year rotation to which fertilizers were applied broadcast in 1934. Left: 500 lbs. 6-8-12, yield 1,470 lbs. per acre. Right: 1,500 lbs. 6-8-12, yield 1,670 lbs. per acre.

Fertilizing Pennsylvania Cigar-leaf Tobacco*

By D. E. Haley

Professor of Soil and Phytochemistry, Pennsylvania State College

LANCASTER county, Pennsylvania, is one of the most prosperous agricultural communities in the United States. There are a number of reasons for this, among which are the inherent fertility of the soil, which is of limestone origin, and the high degree of intelligence manifested by the individual farmers in handling this soil. In no other farming community in the United States is more attention given to the maintenance of soil fertility, and to efficient crop production.

The agricultural background of Lancaster county farmers is an important factor in their success. In the majority of instances, they are direct descendants of the German settlers who first placed the land under cultivation more than 200 years ago, and who themselves represented the twenty-fifth successive generation of farmers in the German Palatinate. It is not unusual to find Lancaster county

* Authorized for publication on December 13, 1935, as paper No. 712 in the Journal Series of the Pennsylvania Agricultural Experiment Station.

farms operated at the present time by lineal descendants of the pioneer settlers, never having been transferred to anyone but a member of the same family. Throughout these 200 years, a consistent effort has been made to increase rather than reduce the fertility of these soils, and with considerable success.

The system of agriculture now pursued in Lancaster county is diversified, and the rotation usually includes the raising of cigar-leaf tobacco. The center of production of this tobacco in Pennsylvania is this area. For this reason, research on this crop has been largely confined to this county.

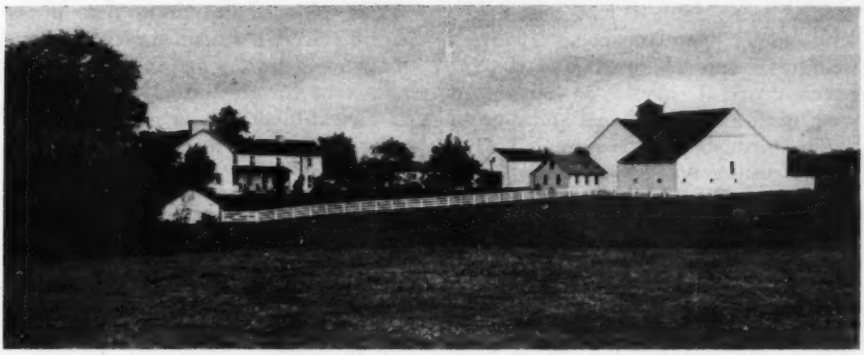
Field experiments on tobacco are conducted on a rather large scale at Roseville, one mile north of the city of Lancaster, under the direction of the Pennsylvania State College in cooperation with the Office of Tobacco Investigations, U. S. Department of Agriculture. The work is supervised by Mr. Otto Olson, the Federal Representative, who is thoroughly familiar with agricultural conditions in the county.

The prevailing opinion of those in charge of the investigations is that it should conform to the general agricultural system peculiar to the county. This policy prevailed at the Ephrata experimental plots some years ago and is maintained at the Roseville plots. The results obtained from these field experiments, supplemented by laboratory tests and by observations of growing crops of tobacco throughout the county, now point to certain fundamental factors which should be given consideration in the production of tobacco, from the standpoint of both yield and quality. These factors may involve definite changes in farming procedure which, however, will in no way interfere with the maintenance of soil fertility.

Contrary to popular belief of some years ago, a soil does not need to be neutral or alkaline in reaction in order to insure good crop yields. Excellent yields of all of the more common agricultural crops have been obtained from slightly acid soils. Moreover, certain crops seem to be better adapted to an acid rather than to a neutral or alka-

Tobacco plots of the three-year rotation to which fertilizers were applied in the row in 1934. Left: 1,000 lbs. 6-8-12, yield 1,974 lbs. per acre. Right: 1,500 lbs. 6-8-12, yield 2,048 lbs. per acre.

line soil; tobacco appears to fall into this general class. Since legumes are common in the rotation system now practiced, a large quantity of available lime must not be present in the soil to insure the growth of the best tobacco. Although legumes are high lime "feeders," excellent yields of legumes have been obtained when the soil was slightly acid in reaction. Some soils, however, are too acid for legumes. In such cases additions of lime in reasonable amounts are to be recommended.



Typical Lancaster county homesteads reflect a degree of agricultural prosperity, due to good soils and good management.

Because the prevailing Lancaster county system is "lime and manure" and because these soils are normally high in lime, they are usually neutral or alkaline in reaction. On the other hand, many famous tobacco soils, such as those in the Connecticut valley, are strongly acid in reaction. During 1935 an experiment was conducted on a farm near Roseville which involved the addition of elemental sulphur to the soil, in conjunction with certain fertilizer mixtures. The quantity of sulphur added was sufficient to increase soil acidity up to and even exceeding the acidity of the average Connecticut tobacco soil. The results indicate that tobacco of good quality may be grown on soils of rather high acidity.

An irrational use of lime is to be avoided on soils where tobacco is grown, for a number of reasons. Phosphorus, the chief limiting factor in plant growth on these soils, is rendered less available to the plant if the soil is alkaline rather than slightly acid in reaction. Furthermore, the absorption of potassium from the soil by the plant is much more efficient under slightly acid than under alkaline conditions. The evidence of one crop, that for 1927, indicates that when the potassium content of the tobacco is high, the lime content is low; and when the potassium content of the tobacco is low, as in the case of an ordinary "dry-year" crop, the lime content is high. When the soil is definitely alkaline in reaction, certain essential elements, such as manganese, may be rendered practically unavailable for plant growth.

An application of 10 tons of manure per acre, which is the amount ordinarily used by Lancaster county tobacco growers, carries approximately 100 pounds of nitrogen, 50 pounds of phosphoric acid, and 100 pounds of potash. From a percentage standpoint, therefore, it appears to be fairly well balanced with respect to these three constituents; but since the nitrogen is more readily available to the plant than either the phosphoric acid or potash, manure is considered a nitrogen fertilizer as well as a source of organic matter.

The value of manure, from the standpoint of the maintenance of soil fertility, can hardly be overempha-

sized; it should be used whenever possible. From the standpoint of the most efficient tobacco culture, however, fresh manure should be applied to the crop preceding tobacco in the rotation, or it should be well rotted before being applied just before the land comes into tobacco. If fresh manure is applied directly to the tobacco crop, it should be reinforced with both phosphoric acid and potash.

The tobacco plant requires nitrogen in the early stages of its growth, and a constant supply, within reasonable limits, should be available throughout the growing season. Excellent results have been obtained without the addition of manure, when two-thirds of the nitrogen added was in the form of cottonseed meal and one-third in a readily available mineral form. Beneficial results were not obtained when these proportions were reversed. Heavy additions of nitrogen, without being properly balanced with phosphoric acid and potash, seriously affect the burning quality of tobacco. An unbalanced nitrogen supply also induces a succulent growth, which lowers the resistance of the plant to the invasion of disease organisms. A more resistant plant results when a balance of nitrogen, phosphoric acid, and potash is maintained.

Our plot results show that phosphoric acid is the main limiting factor of plant growth, and this probably holds true for all soils of this area. A poor yield invariably is associated with a low phosphoric acid content of the plants. A high yield is not possible without ample supplies of this element. As in the case of nitrogen, phosphoric acid should be balanced with the other essential plant foods. An excess of phosphoric acid, however, lowers the quality of the plants, especially the burning qualities.

Tobacco plants liberally supplied with potash are better able to withstand drought than plants having less potash, because of the production of cuticle on the surface of the leaves. Plants high in potash appear to offer maximum resistance to the invasion

(*Turn to page* 34)

Potash irons out the leaf, giving smooth surface and improved texture. Left was fertilized with 1,000 lbs. of 6-8-16 per acre; center with 1,000 lbs. of 6-8-4; right received no fertilizer.

Fertilize to Control Cotton Wilt and Rust

By Dr. V. H. Young

Agricultural Experiment Station, Fayetteville, Ark.

ALTHOUGH losses from cotton wilt and rust are still unnecessarily high, they are due mostly to the failure to follow standard recommendations, rather than to a lack of remedies to be applied.

In 1892 Professor George F. Atkinson, then at the Alabama Experiment Station, and later a famous member of the faculty of Cornell University, called attention in a series of bulletins to most of the serious diseases of cotton as we now know them. With surprising insight and thoroughness Atkinson described such diseases as the Fusarium wilt of cotton, "rust" or potash hunger, root-knot or nematode disease of cotton, and several other less important diseases. Although Atkinson's stay at the Alabama station was brief—lasting only about three years—he described these diseases so clearly and elucidated their causes and the soil conditions which favor them so fully that his work on rust, root-knot, and cotton wilt stands out as the foundation stone upon which all later work with this highly important group of diseases depends.

Atkinson's descriptions of the symptoms of these diseases are so accurate and so simple that today one may well start his education on diseases of the cotton plant by reading Atkinson's bulletins describing "yellow leaf blight," "red leaf blight" (rust or potash hunger), "frenching" (Fusarium wilt of cotton), and cotton "root gall" (root-knot or nematode disease). He noted that cotton wilt is especially a disease of sandy soils, gray lime lands, and of certain "gunpowder" land which becomes powdered and loose in dry weather. He also noted that especially severe attacks of cotton wilt result when root-knot is also a factor. His studies of rust or potash hunger showed that it was prevalent in loose, sandy soils which are lacking in humus and which we now recognize as being very subject to leaching. Atkinson's experiments showed that applications of potash in the form of kainit prevented the yellowing and reddening of the foliage, the premature maturity and defoliation of the plants, and the apparent drouth injury of cotton now known to be very largely the result of potash hunger. In his experiments, yields were often increased from 70-100 per cent through the use of potash fertilizer, particularly kainit.

Potash Controls Rust

Since Atkinson's work was published in 1892, his recommendations for the control of rust have become fully established, and for many years the use of potash fertilizers, the maintenance of humus through green manures or stable manure, and in some cases the drainage of low spots, have come to be recognized as the standard controls for this malady. The relation of root-knot or nematode disease to especially severe attacks of cotton wilt has become a matter of common knowledge; and likewise, its control through rotations with resistant crops which starve out the nematodes in the soil, such as corn, Iron or Brabham

Cotton plant seriously affected with cotton wilt before any cotton has set. Such plants often disappear before the end of the season.

cowpeas, Laredo soybeans, and certain other crops, and the eradication of susceptible weeds has served greatly to reduce losses both from root-knot itself and from cotton wilt.

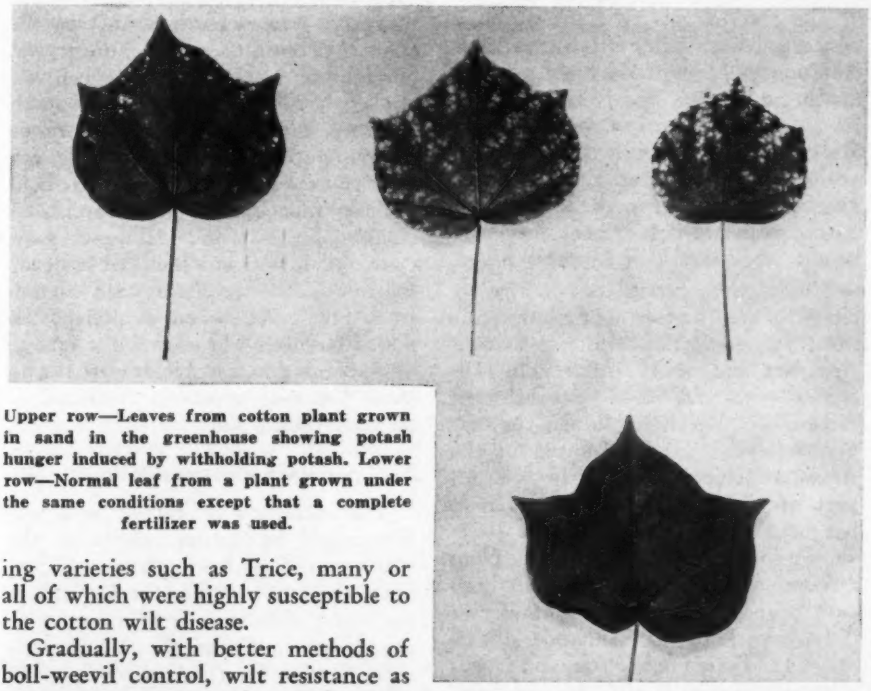
Unfortunately, the Fusarium wilt of cotton has proved a much more complicated problem than either potash hunger or root-knot, and though much has been written about the disease, its cause and the conditions favoring it, the truth is that control measures have been only partly effective and in many cases have been entirely unacceptable to many cotton growers. Although the disease is of parasitic origin, the environmental factors favoring severe attacks are so complex, involving as they do the nature of the soil, the presence or absence of root-knot, soil and air temperatures, soil moisture, and no doubt other environmental factors, that ordinary control methods have not sufficed. Rotations have been of little avail against a fungus that seems able to live almost indefinitely in the soil and still retains its power to attack cotton when it is finally put back on the land. Very early the control of root-knot, as described above, became recognized as necessary for the control of cotton wilt, and this recommendation still remains the first to be made wherever it is a factor.

Soon after Atkinson's work appeared in 1892, William A. Orton and others noted the survival of certain individual cotton plants in fields badly affected with the wilt disease, and through field selection there soon ap-

Plant killed by wilt after setting a few bolls.

Plant killed by wilt late in the season.

peared varieties of cotton highly resistant to the cotton wilt disease. Although many of these resistant varieties were inclined to short staple, lateness, and difficulty in picking, they proved comparatively satisfactory until the advent of the boll-weevil. Because of the severe injury to which late fruiting cotton is subject during periods of boll-weevil damage, most of the wilt-resistant varieties were immediately abandoned for early maturing varieties such as Trice, many or all of which were highly susceptible to the cotton wilt disease.



Upper row—Leaves from cotton plant grown in sand in the greenhouse showing potash hunger induced by withholding potash. Lower row—Normal leaf from a plant grown under the same conditions except that a complete fertilizer was used.

Gradually, with better methods of boll-weevil control, wilt resistance as a necessary property of a good cotton variety has again come to the fore, and many highly resistant and partially resistant (wilt tolerant) varieties have been developed. Many selections from the old Texas Rowden, Dixie Triumph, Dixie 14, Super Seven, Clevewilt, and many other wilt-resistant varieties are now available. While the problem of wilt resistance in cotton will never be a completed task, it is one in which real progress is being made and will continue to be made.

During the 43 years since Atkinson's first publication on cotton wilt, many persons have looked for simpler and more effective methods for the control of cotton wilt through soil treatments. No doubt the fact that cotton wilt so often appears on the same sandy, alluvial soils which are so apt to favor rust or potash hunger, and does not often appear on clay soils or heavy delta soils, has led many to suspect that cotton wilt is a disease of weakened or undernourished plants. Possibly the effect of the root-knot disease in breaking down the cotton plant's resistance to the disease may have strengthened this idea. To every farmer, and to every plant pathologist for that matter, the great desideratum for the control of such a soil-borne disease as cotton wilt is, of course, some simple soil treatment, such as the application of lime, stable manure, or commercial fertilizer which will not only control the disease at hand, but also bring about large and profitable increases in yield over and above those which might be expected to result from disease control alone.

At the Arkansas Experiment Sta-

tion an attempt has been made since 1926 to develop a rational program for the control of the cotton wilt—potash hunger — root-knot complex, which would include the development of cotton varieties resistant to the cotton wilt disease, use of rotations for the control of root-knot, use of potash fertilizers and green manures for the control of rust, and the use of fertilizers for the control of cotton wilt.

Home-Made Evidence

The part of this program which is concerned with wilt-resistant varieties is in continuation of the early work of Orton and others and is not reported here, and the control of root-knot had already been established for many years. The results obtained through use of fertilizers for the control of cotton wilt and rust are the only part of the work considered in this paper.

Studies were carried out in the vicinity of the Cotton Branch Experiment Station in Lee county in eastern Arkansas and at 12 other points in central, eastern, and northeastern Arkansas. Recently similar experiments have been inaugurated in the Arkansas River valley in the western part of the state. In all cases land has been selected where severe losses were being experienced, generally from a combination of cotton wilt and rust or potash hunger. In one case only, root-knot or nematode disease was a further complication, and it was apparent there that the effect of root-knot was so completely to break down the resistance of cotton to the wilt disease that other control measures were much less efficient. Some of the experiments consisted only of non-fertilized plots and plots fertilized either with a mixed fertilizer containing potash or muriate of potash alone, but in most of them a series of fertilizers with increasing increments of potash was used. In a few of the outlying experiments only two series of plots were included, but at the Cotton Branch Experiment Station nine different treatments were included, in addition to non-treated checks, and each treatment was repeated at four different points in the experimental field. Some of the outlying experiments extended over only one or two years, while those at the Branch Experiment Station were inaugurated in 1929, and with the season of 1935 this work now includes data for seven years.

In every one of the experiments carried out in connection with this work, except the one case noted above where root-knot was a serious factor, the control of rust or potash hunger was outstanding in plots where potash was applied. This was shown in much thriftier, greener growth, absence of yellowing and reddening of the leaves, the power of the plants to hold healthy foliage until frost, and particularly in increased yields—in some cases amounting to a hundred per cent increase in the weight of seed cotton. In a few cases, when a high-potash mixed fertilizer was used at the rate of 600 pounds per acre, yields were nearly three times as great on fertilized as on unfertilized plots.

Potash Controls Wilt

The incidence of cotton wilt was determined by actual counts of the whole stand and of plants affected with the cotton wilt disease, and in the more elaborate experiments conducted at the Cotton Branch Experiment Station for the past seven years, wilt counts were made every 15 days from late June until September. Space does not allow a presentation of complete numerical data from all of this work, which may be found in the original publications, but the data from one of the more complete 1933 experiments are presented in the following table as being entirely typical of the results obtained.

An examination of the data reveals pronounced responses in yield to both nitrogen and potash alone and in combination, but not to phosphorus alone.

(*Turn to page* 37)

Meeting New Hampshire's Pasture Problem

By Ford S. Prince

Agronomist, New Hampshire College of Agriculture

FEW ideas advanced to farmers of the Northeast in recent years have had such widespread appeal as the one that something must be done about pastures. Back in the pre-depression era, when milk prices were favorable and a farmer could really afford to barn feed all summer long to keep his herd in high production, little was thought, said, or done about pastures. On many farms feed from the pasture was practically disregarded, and a full ration was barn fed the year round.

Post-mortems are always gruesome affairs. There is no need to trace the decline of pastures in the Northeast from the days when many of them would support a cow to the acre to the point where they now are. It takes a fertile soil to produce feed enough on an acre to support a cow. As nothing was done during the past century to replace the plant food removed in the milk and bones of the animals, the pastures suffered. It seems difficult now to believe that this could have happened in a section where fertilizers are commonly used, and where the field land on the better farms is kept in a reasonably good state of fertility.

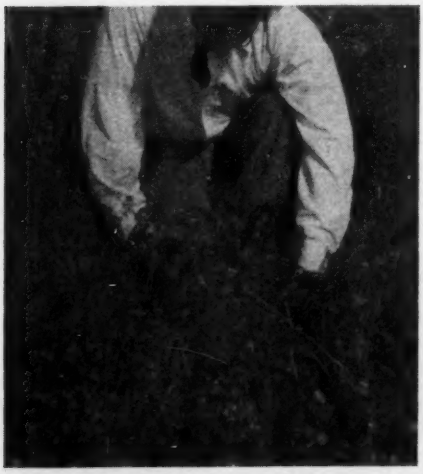
Perhaps it is not quite accurate to say that pasture consciousness and depression milk prices were coincidental. It is probably more nearly correct to state that depression in the fertilizer industry pricked farmer minds into pasture consciousness, for

Frances Peaslu, Pittsfield, New Hampshire, divided his pastures, reseeded two acres, and top-dressed 18 acres of new pasture in 1935.

it was the representatives of these fertilizer companies who first established the fact, by demonstration, that not all of the old pastures are hopeless and that many of them can be top-dressed to the profit alike of the farmer and the fertilizer man. This gave the fertilizer companies a new outlet for their product and farmers new hope and courage to grow more of their pasture crops. It will doubtless help to lead both groups out of depressed industries.

When the human mind becomes aroused as it did in this instance, and forcibly, too, because about that time milk prices were cut almost in half, it begins to seek ways out of its dilemma. Had milk prices continued to soar, it is doubtful if much progress could have been made with this intricate problem. Perhaps farmers would have used more fertilizer on their pastures than formerly, but would they have been so eager to master every method of pasture improvement at their command? Not likely.

I have been on the "firing line" in New Hampshire for almost 11 years, before and during the depression, out of the bright years into the dusk, and now into daylight again. I have had an opportunity to study the farmer's moods and outlook. Well I remember when an intensive system of pasture management was launched in our neighboring state of Massachusetts. "That's all right for an Experiment Station," said many farmers to me in essence, "but we don't expect that we will ever divide our fields into small paddocks and fertilize heavily like they are doing." But they did and are. Answering a recent questionnaire, 493 of 1,196 New Hampshire farmers state that they divided their pastures in 1935, and most of them used fertilizer or grew for their cows special crops to be grazed during the short pasture period.



Mixed White Dutch Clover and grasses make ideal permanent pasture. This one had a complete fertilizer and made a luxuriant growth all through the season.

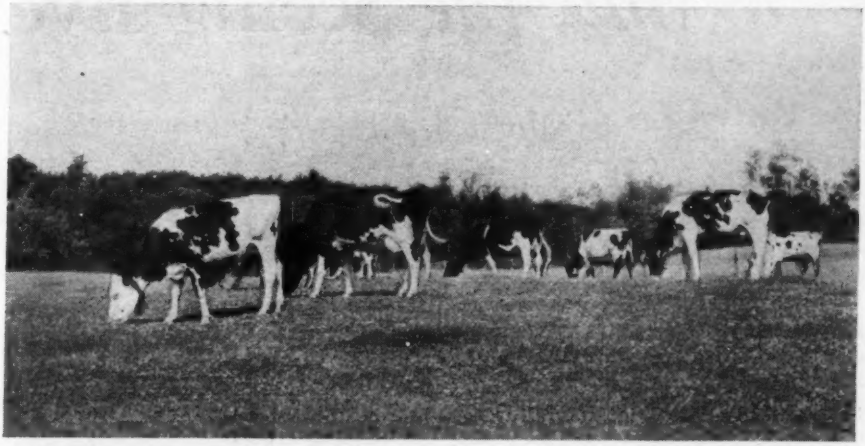
Allow Pastures to Rest

It now appears that this matter of dividing up the pasture acreage has probably been adopted as widely in New Hampshire as any other phase of improved pasture management. At first, supplying water and fencing costs for the smaller fields seemed almost insurmountable obstacles on many farms. A trial, perhaps just splitting the pasture into two parts, was enough to convince a man that this is one way of quickly increasing the amount of feed that he secures from his pastures, and the tendency now is to make more rather than less subdivisions. By this method the various sections of the pasture are rested from 20 to 25 days out of each month and grazed the balance, or 5 to 10 days. During the rest period, the grass has a chance to recover and make a more luxuriant growth than where the cows are allowed to roam over the whole area all of the time.

Farmers with ample pasture acreage on the heavier soil types, where feed is normally good, find that dividing the area into three or four fields is probably all they need to do to tide them over, except during the period of extreme feed shortage. Some of the very best farmers have thus been able to get by without any additional means of pasture stimulation.

Those who are not so fortunate as

to have a large area of good pasture are combining fertilization along with splitting their pastures into paddocks. Controlled grazing on heavily fertilized land is particularly important to prevent too close cropping of the highly palatable forage that is produced. Dividing allows also for an opportunity to fertilize at different times so that the forage will be produced as needed.



These cows on the farm of E. E. Farrar, Henniker, New Hampshire, grazed on very light intervale soil fertilized with 250 lbs. of 8-16-14 per acre. Mr. Farrar top-dressed 13 acres of pasture in 1935 and plans to seed 10 acres more to permanent pasture in 1936.

In any state where conditions on individual farms are as varied as they are in New Hampshire, the Extension man's pasture platform must carry several planks in order that it may appeal to all. A few farms have all the pasture they need if it is well managed. A much larger portion have sufficient pasture through May and June, very little through July and August, and a part of their needs in September and early October. In other cases there is a small amount of pasture all of the time but never enough, and on a few highly specialized farms no pasture whatsoever is available. Within these various groups are farms with a variety of soils and pastures varying from good to those in the lower stages of decrepitude, varying from some of the better tillage areas to the roughest of stony land, including that which is already so grown up to bushes and trees that it is pasture only in name.

One of the first jobs in our Extension program has been to correct the idea that some of the rough, stony, and grown-over land is pasture land. We have constantly held the idea before our farmers that a good pasture should carry in the neighborhood of a cow to the acre after it is improved, and we have tried to make them see that if they could reach that goal, they could afford to fertilize, lime, fence, bring water to the paddocks, cut brush; in fact, do everything necessary to keep the pasture thrifty and producing well.

"Treat only the best areas of permanent pasture" has been the slogan. If there is no permanent pasture worth improving, then take some of the tillage land for pasture or pasture the rotation fields, has been our advice. Even with good management it has been found necessary on the majority of farms to supplement in most seasons during part of July and August with crops grown especially for pasture. For this purpose, oats for July

(*Turn to page* 40)

The Inquiring Mind *and the* Seeing Eye

By Alister B. Alexander

Madison, Wisconsin

WAY DOWN in Texas, the largest state in the Union, the state that has flown the flag of six nations and is famous for its crops, its sacred Alamo, and its diversity of soil, climate, and resources, lives a man who is not only one of the noted chemists of the United States, but who is, we have been told, an ardent radio fan, who spends as much of his time as possible listening to his favorite programs. So. in the language of Major Bowes, this month we salute George Stronach Fraps, State Chemist of Texas, a native son of North Carolina, who moved on into new fields, and who has materially added to the soil fertility, fertilizer control, and agricultural knowledge of his adopted state.

Well Prepared

George Stronach Fraps was born at Raleigh, North Carolina, on September 9, 1876, the son of Anton Wetzel and Margaret Elizabeth Lumley Fraps. After attending the grammar and high schools of his native Raleigh, he entered the North Carolina College of Agriculture and Mechanic Arts, now part of the University of North Carolina, where he received his B.S. degree in 1896. During the years 1898 and 1899 he was a fellow at Johns Hopkins, where he was granted the degree of Doctor of Philosophy in 1899. On June 17, 1903, Dr. Fraps was married to Ellen Hale Saunders, of Durham, North Carolina, to whom were born George Saunders Fraps, Mary Brandon Tinus Fraps, and Richard Benbury Saunders Fraps (deceased).

From 1899 to 1903, Dr. Fraps acted as assistant chemist at the North Carolina College of Agriculture and Mechanic Arts, and at the North Carolina Experiment Station, and also as assistant professor of chemistry, advancing to the title of associate professor during the years 1904 and 1905. In 1905 he became State Chemist of Texas; this post he still holds. Dr. Fraps has also acted concurrently as chemist for the Texas experiment station and as professor of chemistry at the Texas Agricultural and Mechanical College at College Station. In 1927 he was appointed delegate for the United States to the First International Congress of Soil Science. He is a member of the American Chemical Society; American Society of Agronomy; Association of Official Agricultural Chemists, of which he was president in 1913; American Soil Survey Association; American Society of Animal Production; Fellow of the American Association for the Advancement of Science; and the fraternities of Phi Kappa Phi and Phi Beta Kappa.

Dr. Fraps has been a very prolific writer, and in addition to his books on "Principles of Agricultural Chemistry," published in 1913, and "Prin-

ciples of Dyeing," in 1903, he has contributed over 250 bulletins and articles in chemical journals and other scientific publications.

In discussing the work of Dr. Fraps with Walter B. Griem, Chief Chemist of the Feed and Fertilizer Inspection Service in Wisconsin, we were told, "I consider Dr. Fraps a very scholarly

DR. GEORGE S. FRAPS

chemist who has done a great deal for Texas, for the fertilizer industry, and for the advancement of agricultural science. One of his outstanding accomplishments has been his untiring effort to reduce and standardize the number of commercial fertilizers offered for sale."

In this connection, it is interesting to note that at one time there were some 165 different grades of fertilizer sold in Texas. At the present time, according to an address given by Dr. Fraps at the annual meeting of the Texas Feed Manufacturers in 1935, the number now offered on the Texas market has been reduced to 23. This was accomplished through much sacrifice on the part of some of the manufacturers, who scrapped grades of fertilizer that had been sold in Texas for decades, but the results have been beneficial both to the manufacturers and consumers of the fertilizers.

The Texas manufacturers have also raised the grade of fertilizers, with the result that the purchaser gets a better fertilizer at less cost than he would otherwise. We have been told that through this effort on the part of Dr. Fraps, other Southern states have cooperated and are adopting standard grades in reduced numbers, which will benefit agriculture materially.

Urged Standardization

In the address above mentioned, Dr. Fraps also advised the feed manufacturers to adopt similar methods and to standardize on scientifically compounded feeds. He said, in part, "You, as manufacturers of feeds, like the manufacturers of fertilizer, are in a peculiar position toward your customers. The purchaser of fertilizer must get enough increase in his crop to pay for the fertilizer and to give a profit. A purchaser of commercial feeds must produce enough of livestock, eggs, milk, or other animal product to pay for the feed and to make a profit. Otherwise, neither can continue to purchase fertilizer or feedstuffs. It is to the interest of the fertilizer trade to give the most fertilizer value for the least money and to see that the fertilizer is adapted to the soil and to the crops, so that the purchaser can make his increased crop and secure his profit."

There is a great diversity in Texas climatic conditions and in Texas soils, owing to the great expanse of the state, covering as it does more than 10 degrees of latitude and ranging in altitude from the sandy Coastal Plain to the rugged ranges of the west. The soil of most of the state is susceptible to cultivation. Considerable areas of

alluvial soil are found along the lower courses of the rivers, especially in the eastern part. The narrow coast belt is mainly a sandy soil, while the soil of the prairie belt is composed of some sand in the timber spots but is mostly a dark clay mingled with vegetable mold and commonly called black waxy. Farther west the soil is a composition of weathered limestone and clay, which needs only water to develop its fertility. Speaking from personal experience gained from the hurricane deck of a horse while an officer of the 14th U. S. Cavalry, we have seen some of this land produce as if by magic, when water was added; and it almost seemed as if some of the Chinese onion growers had inherited some mystic power from ancient times, when we saw what they could do with their few acres.

Judgment Based on Survey

Dr. Fraps has made a careful soil survey of a great many of the counties of Texas, and 13, or possibly more, bulletins have been published by him on this subject. In Bulletin 482, dealing with the soils of Henderson, Hidalgo, Milam, Nacogdoches, Navarro, Wichita, Willacy, and Victoria Counties, it is interesting to read his recommendations for dealing with these typical Texas soils. The following are some of the essentials to the maintenance or improvement of soil fertility advised by Dr. Fraps after many years of careful study, and should be of interest to readers everywhere.

1.—The store of nitrogen and humus in the soil should be maintained. Growing legumes in a proper rotation and turning these under or grazing them off are usually to be advised. The nitrogen of the soil may be supplemented by the use of nitrogenous fertilizers. Losses of nitrogen due to cropping eventually result in a deficiency of nitrogen.

2.—Deficiency of phosphoric acid in the soil should be corrected by the use of phosphates as a fertilizer. Losses of phosphoric acid due to cropping eventually result in a deficiency of phosphoric acid.

3.—Any acidity sufficient to be injurious to the crops being grown, if present, should be corrected by applications of ground limestone or lime. Lime and limestone are also used for the improvement of the physical character of heavy soils poor in lime and for supplying lime for crops which need a quantity of lime. Lime should be used chiefly in connection with a systematic rotation in which a suitable legume is included.

4.—Any deficiency of potash in the soil should be corrected by the use of a fertilizer containing potash. Losses of potash due to cropping eventually result in deficiency of potash.

5.—Erosion or washing away of the more fertile surface soil should be prevented.

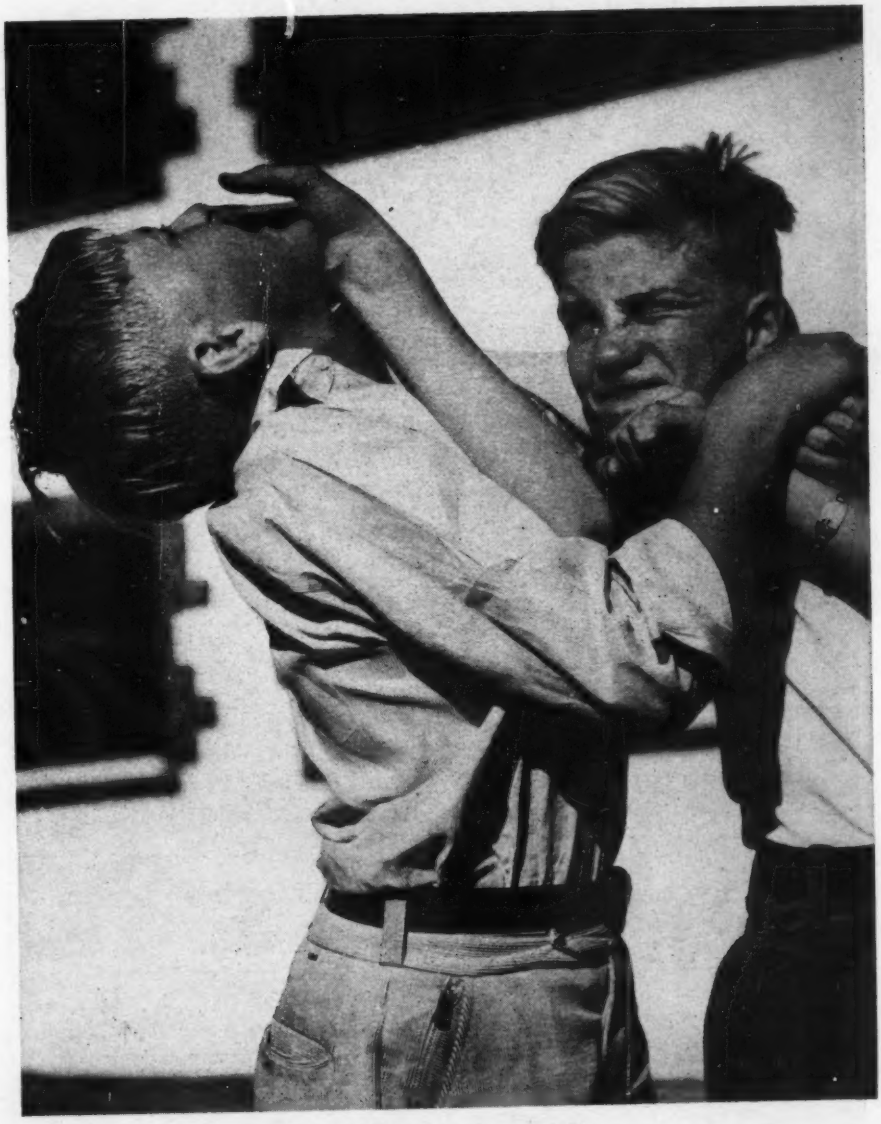
6.—Land under irrigation should have good underdrainage, either natural or artificial, so that salts dissolved in the irrigation water will be washed out and will not accumulate in the soil.

This sound advice given by Dr. Fraps has undoubtedly done a great deal of good to the Texas soils. The maintenance of the humus, produced by the partial decay of vegetable matter in the soil, aids materially in maintenance of fertility. Humus, in sufficient quantity, helps soils to hold a favorable amount of water, so as better to resist drought. It helps to give a fine, crumbly structure to clay soils and enables them to break up into good condition of tillage under the action of the cultivating implements. It checks the rapidity of the percolation of water through sandy soils, thus decreasing loss of plant food.

Humus is also the storehouse for most of the nitrogen of the soil. Nitrogen in humus is insoluble in water and cannot be taken up by the crops or washed out of the soil, but it is grad-

(*Turn to page* 35)

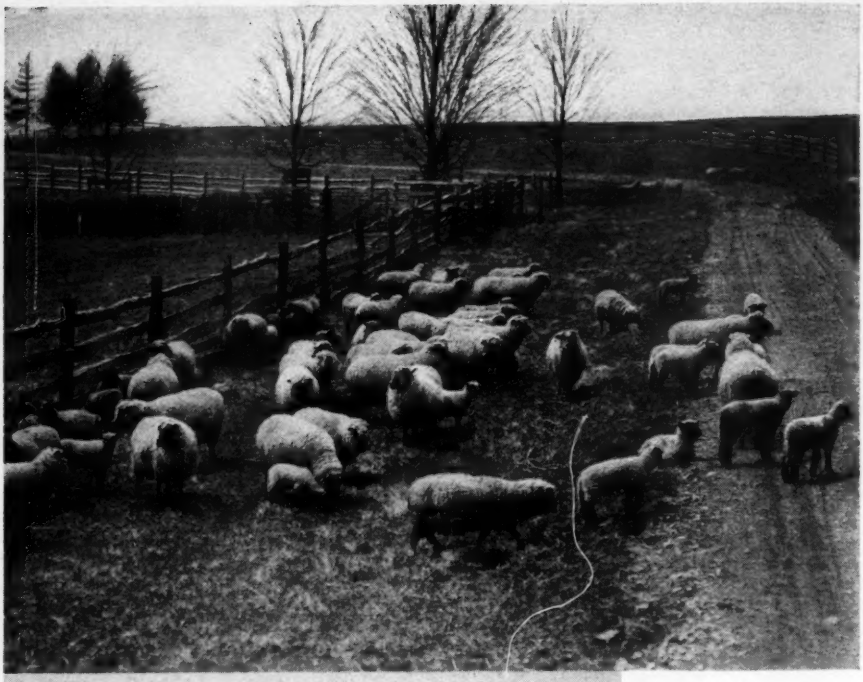
Pictorial



"YOU WILL, WILL YOU!"

SPRING—OVERHEAD AND UNDERFOOT . . . .

. . . . HAS ITS ATTRACTIONS AND DISADVANTAGES.



Above: The welcome accorded sunny, spring days by the farm animals adds to the enchantment of the season.

Left: Two embryo cowboys pause to face the camera. However, the pony doesn't seem much interested in the "birdie."

The Editors Talk

Soybean Trends

The soybean is America's fastest expanding crop. It is taking a place of major importance in our agriculture and last year ranked fifth among grains in farm value. That the fertilization of soybeans will receive increasing attention is inevitable. Therefore, we wish to call the particular attention of our readers to the article SOYBEAN TRENDS, by Geo. L. Schuster, of Delaware, on page six of this issue. Professor Schuster points out that even under present methods of fertilization thought to be adequate, yields have decreased.

According to the U. S. Department of Agriculture, the soybean acreage in this country has more than doubled in the last few years. It rose from 2,000,000 acres in 1924 to nearly 5,000,000 last year. Production of the beans themselves increased from 5,000,000 bushels in 1925 to last year's tremendous crop of more than 40,000,000 bushels. The 1934 crop was only a little more than 20,000,000 bushels. The reasons for this increase—in addition to the demand for beans for food, feed, and industrial uses—are immunity of soybeans to chinch bugs and other pests, good prices compared with other grain crops, drought resistance, and high seed yield.

Additional uses for soybeans are anticipated as a result of the recent establishment of a cooperative soybean industrial research laboratory at Urbana, Illinois. This laboratory has been set up by the U. S. Department of Agriculture and 12 North Central States—Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Nebraska, Kansas, Missouri, and the Dakotas.

The three immediate objectives of the new laboratory are: improvement of present industrial uses and development of new industrial uses for soybeans; more facts on the effects of different processes on the quality and quantity of soybean products; and facilities for testing different varieties as to adaptability for industrial use. On experimental plots nearby, plant breeders hope to grow new varieties even better suited to industrial demands.

The establishment of this new soybean research laboratory is an additional step in the new emphasis on the greater and more varied utilization of a crop. Its importance to the betterment of American agriculture is obvious and its work will be watched with keen interest.

Balanced Fertilizer

Included in a great deal of interesting work reported in the recent Annual Report of the Georgia Coastal Plain Experiment Station are many references to the efficient use of potash. Tests show that cotton needs a balanced fertilizer containing the three principal plant-food elements, or as the Report notes—a definite formula recommendation will not fit all types of soil. It is considered advisable to make general recommendations. For Coastal Plain soils in a good state of fertility, 9 per cent phosphorus, 3 per cent

ammonia, and 5 per cent potash are recommended, supplemented by nitrogen when the first squares appear.

On land where cotton has a tendency to rust, the potash should be increased to about 8 per cent or an application of potash should be applied as a top-dressing just prior to the blooming period. Tests with varying amounts of potash from nothing to 10 per cent for 6 years show a marked increase in potash up to 8 per cent. Sometimes the 10 per cent over the 8 per cent produced an increase and sometimes it did not. But it should be pointed out that 600 pounds of fertilizer per acre were used, which is, of course, much higher than the average application, so that with smaller total amounts of fertilizer per acre where rust exists, it would be necessary to top-dress with potash in addition to the fertilizer used. Excellent results were obtained with top-dressing with varying amounts of muriate of potash up to 200 pounds per acre, in addition to 600 pounds of a 9-3-5.

Peanuts show less response to fertilizer application than cotton or corn, especially where peanuts follow a rotation in which other crops are liberally fertilized. On lands in a good state of fertility, fair gains may be expected from an application of 200 to 300 pounds of 10-0-4 (PNK) fertilizer per acre. On thin land, it is suggested that a 10-2-4 or a 10-2-6 be used. Sweet potatoes demand potash. Data obtained from a 10-year study of fertilizer requirements on this crop indicate that 8 per cent phosphoric acid, 4 per cent ammonia, and 6 to 8 or 10 per cent potash (the latter on light sandy soils) to be the best suited to this crop. Irish potato requirements indicate that the most desirable amount of plant food is a formula consisting of 6 to 8 per cent phosphoric acid, 6 to 8 per cent ammonia, and 8 to 10 per cent potash. The general conclusion is that under most conditions tobacco fertilizers should contain 8 parts phosphorus, 3 parts ammonia, and 5 to 8 parts potash. The formula need not be an 8-3-5 or 8-3-8, but it is desirable that these proportions of phosphorus, ammonia, and potash be maintained.

It is important to note that "potash tests show rather conclusively that the higher potash formulas are to be preferred over the 5 per cent goods."

The report is written in a very practical manner and contains a great deal of useful information not only about crops but about various divisions of animal husbandry.

Charles E. Thorne

American agriculture has lost another of its "grand old men." Dr. Charles E. Thorne, director emeritus of the Ohio Experiment Station, died at his home in Wooster, February 29.

Quoting from a fine tribute in an editorial in the OHIO FARMER, "Throughout his life Director Thorne was a constant seeker after the truth. . . . Such patience as he exhibited, both in seeking the answers to agricultural problems and in time of trouble, is a rarity in the world today and Ohio is going to miss him sorely.

"The nation will likewise miss this man who was so prominent at all gatherings of agricultural scientists. The foundation of the long-time soil fertility work that he early laid at the Ohio Station not only served its purpose in building Ohio agriculture upon a sound basis but has since become the model and forerunner of this type of work throughout the nation. Dr. Thorne's passing will be missed both at home and throughout the scientific world."

Better Crops was pleased to present to our readers in our issue of July, 1931, the late Dr. Alexander's tribute to Dr. Thorne, "Dean of American Agricultral Experiment Stations."

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

A preliminary report of noteworthy interest to peach orchardists over a wide territory is given in Horticultural Circular Number 10, Cooperative Extension Work in Agriculture, The Clemson Agricultural College, South Carolina, entitled "Peach Trees in South Carolina Develop Abnormalities with Nitrogen Fertilization Alone." The authors, E. H. Rawl and W. H. Stallworth, specify that essential elements other than nitrogen must be applied to the peach orchard for normal production. The demonstration results are based on one year's work.

The abnormal condition seriously affected a 14-year-old Elberta peach orchard in the most important peach-growing section of the state in 1934, resulting in an enormous loss to the owner, according to the circular. A survey of other orchards throughout the state showed that 26 orchards of 77 inspected were affected by this abnormal condition, although orchards under 5 years of age did not indicate serious aspects of the typical symptoms.

"In the early stage of the abnormal condition the leaves first changed to a light yellowish-green color, later to a very pale yellow, followed by burning or 'scorching' of the tips and margins of the leaves," state the authors in describing the condition. "Finally, the leaves were considerably curled, showing a bronzing or browning, eventually resulting in a great scarcity of peach buds." It is further shown that this abnormality ultimately results in a very light crop of undersized fruit.

The fertilizer treatment to this Elberta orchard since 1926 has consisted chiefly of sulphate of ammonia. Fertilizer demonstrations conducted in this orchard during 1935 indicate that treatments of nitrogen, phosphorus, potassium, and dolomitic limestone or basic slag greatly improved the peach trees. Such treatments produced healthy and rank foliage, whereas the continued application of nitrogen alone reproduced the abnormality in 1935 in a more acute form. Fruit wood and bud development, fruit development, number of peaches of different sizes, and other factors determined from these demonstrations are discussed.

"Department of Agriculture of Oregon Bulletin," State Dept. of Agr., Salem, Oreg., No. 45, Sept. 1935.

"Commercial Fertilizers in 1934-35," Agr. Exp. Sta., College Station, Brazos County, Texas, Bul. 517, Dec. 1935, G. S. Fraps and S. E. Asbury.

Soils

Many important activities which constituted the principal functions of the Bureau of Chemistry and Soils and the Soil Conservation Service, United States Department of Agriculture, are summarized in the 1935 annual reports of the respective chiefs.

Included in Chief Henry G. Knight's Report of the Bureau of Chemistry and Soils are instructive discussions pertaining to the Bureau's basic research on soils, fertilizers, and agricultural products. Listed among the research work encountered during

the past year are investigations of soils and peats, nitrogen, potash, and phosphate fertilizer materials and their sources, concentrated mixed fertilizers, composition of foods, utilization of wastes from crops and industries using farm products, and improvements in the technic of producing fertilizers and many other materials. Chief Knight remarks that the "Bureau of Chemistry and Soils is continually striving to give more of its attention to basic or fundamental research to develop new scientific facts and principles relating to soils, fertilizers, plant and animal nutrition . . . which facts and principles may be applied by those engaged in agriculture or industries based on agriculture."

Concerning the objectives of the Soil Conservation Service, Chief H. H. Bennett relates in his report that they are "to propagate the use of soil conservation practices in agriculture through the medium of demonstration; to effect at the same time a maximum control of erosion on as large an area of agricultural land as possible; and to ascertain the fundamental scientific facts essential to the development and improvement of soil-conservation methods and technics." Because of the vast area of erodible lands of the country, a national plan of demonstration and education to convince farmers of the necessity for practical soil protection is a logical approach by which the Service seeks to effectuate control measures. The report stresses the fundamental element of coordination of method in land treatment. The application of approved principles to correct use, the adoption of improved cultural practices, and the employment of both engineering and agronomic methods according to the peculiar needs and adaptation of the land, essentially achieve effective control of soil erosion, Chief Bennett emphasizes.

"Soil Erosion Control in Farm Operation," Agr. Exp. Sta., University Farm, St. Paul, Minn., Sp. Bul. 170, *Aug.* 1935, *H. B. Roe and J. H. Neal.*

"Peat and Muck, Character and Utilization," Agr. Ext. Serv., Cornell Univ., Ithaca, N. Y., Bul. 320, *Mar.* 1935, *B. D. Wilson.*

"Base Exchange Properties of Some Typical Texas Soils," Agr. Exp. Sta., College Station, Texas, Bul. 520, *Dec.* 1935, *G. S. Fraps and J. F. Fudge.*

"Soil Survey of Bourbon County, Kansas," U. S. D. A., Washington, D. C., Series 1931, *No.* 12, *M. H. Layton and C. E. Dornberger.*

Crops

Circular No. 3, Tennessee State Department of Agriculture, entitled "How to Grow Strawberries in Tennessee," by E. M. Prather, State Horticulturist, contains information that will prove very instructive to prospective growers of that state who contemplate going into the strawberry business. The publication advocates the limitation of plantings to one or two varieties most adapted to local conditions. Suggested as the leading varieties grown in the state are the Blakemore, Klondike, Aroma, Premier, and Missionary varieties. It is advised that only the very best plants obtainable should be planted, preferably those which bear a State Nursery Inspector's Certificate. Soils capable of producing 20 to 30 bushels of corn per acre are said to insure good yields of strawberries.

Soils rich in decayed plant material do not require fertilizers when the plants are set, but 400 to 600 pounds of a 4-12-4 (N-P-K) fertilizer per acre should be applied to the matted rows early in the fall. On the other hand, the author recommends the broadcast application of 400 to 600 pounds of a high analysis fertilizer per acre on soils of average fertility as they are being prepared for planting. The second crop of berries calls for an early fall application of fertilizer similar to the first, and when a third crop is attempted, the fertilizer program for it is the same as for the previous crops.

Other factors discussed in this circular are methods of soil preparation, strawberry planting, cultivating, and establishing the matted row, mulch-

ing the strawberry field, and control measures for insects and diseases.

The University of Florida Agricultural Experiment Station Bulletin No. 288, "A Wilt-Resistant Watermelon for Florida," by M. N. Walker, portrays the development of a superior melon variety which may be planted on wilt-infested soil. The report discloses that this important development will permit the re-utilization of thousands of acres of land once used for melon production which are now considered unsafe. This variety has been designated as "Leesburg," and was originated from the Kleckley Sweet variety. Through continued self-fertilization and selection, the new melon is claimed to possess certain characters not conspicuous in the Kleckley Sweet. Of these the report mentions, in addition to its resistance to wilt, that the Leesburg has increased toughness of rind and is lighter in color than Kleckley. It is believed the high quality of this melon will justify its general planting, judging from the promise it has shown as a result of experimental observation at Leesburg, Florida. The bulletin describes the nature of wilt disease and a summary of the work at Leesburg.

"Asparagus Production in California," Agr. Ext. Serv., Berkeley, Calif., Cir. 91, *June* 1935, *G. C. Hanna.*

"Spinach Production in California," Agr. Ext. Serv., Berkeley, Calif., Cir. 92, *July* 1935, *G. W. Scott.*

"Dahlia Variety Test, 1935," *Ga. Exp. Sta., Experiment, Ga., Cir.* 105, *No.* 1935, *W. D. Armstrong, H. L. Cochran, and David D. Long.*

"A Year's Progress in Solving Farm Problems of Illinois, 1933-34, *Forty-Seventh Report," Agr. Exp. Sta., Urbana, Ill., H. W. Mumford, Director.*

"Effect of Soybeans on Corn Yields," Agr. Exp. Sta., Baton Rouge, La., Bul. 265, *July* 1935, *H. B. Brown.*

"The Forty-Eighth Annual Report of the University of Maryland, Agricultural Experiment Station," Agr. Exp. Sta., College Park, Md., H. J. Patterson, Director.

"Killing Weeds with Chemicals," Agr. Ext. Serv., Amherst, Mass., Ext. Leaf. 78, *Rev. May* 1935, *Orton L. Clark.*

"The Quarterly Bulletin," Agr. Exp. Sta., East Lansing, Mich., Vol. 18, *No.* 2, *Nov.* 1935.

"Growing Good Crops of Oats in Missouri," Agr. Exp. Sta., Columbia, Mo., Bul. 359, *Jan.* 1936, *W. C. Etheridge and C. A. Helm.*

"Comparison of Some Methods of Growing Onions," Agr. Exp. Sta., Bozeman, Mont., Bul. 305, *Nov.* 1935, *C. C. Starring.*

"Fifty-Fourth Annual Report for the Fiscal Year Ended June 30, 1935," *Agr. Exp. Sta., Geneva, N. Y., U. P. Hedrick, Director.*

"The Chemical Determination of the Quality of Canned Green Peas," Agr. Exp. Sta., Geneva, N. Y., Tech. Bul. 233, *Oct.* 1935, *Z. I. Kertesz.*

"Soil, Field-Crop, Pasture, and Vegetable-Crop Management for Erie County, New York," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Bul. 630, *May* 1935, *A. F. Gustafson, D. B. Johnstone-Wallace, F. O. Underwood, C. S. Pearson, and F. B. Howe.*

"Weeds of New York," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Bul. 635, *June* 1935, *W. C. Muenscher.*

"Random Notes on Fruit Tree Rootstocks and Plant Propagation, II," Agr. Exp. Sta., Geneva, N. Y., Bul. 657, *Oct.* 1935, *H. B. Tukey and K. D. Brase.*

"Peony Growing," Cornell Univ. Agr. Ext. Serv., Ithaca, N. Y., Bul. 321, *Apr.* 1935, *A. M. S. Pridham, C. E. F. Guterman, and Grace H. Griswold.*

"Lespedeza and Alfalfa Hay for Dairy Cows," Agr. Exp. Sta., State College Station, Raleigh, N. C., Bul. 302, *Oct.* 1935, *C. D. Grinnells.*

"An Opportunity—Use Rented Acres to Build Fertile Soils," Agr. Ext. Serv., Raleigh, N. C., Ext. Misc. Pamphlet 24, *Dec.* 1935, *E. C. Blair.*

"The Bimonthly Bulletin," Agr. Exp. Sta., Wooster, Ohio, Vol. XXI, No. 178, *Jan.-Feb.* 1936.

"Forty-Eighth Annual Report of the South Carolina Experiment Station for the Year Ended June 30, 1935," *Agr. Exp. Sta., Clemson, S. C., Dec.* 1935, *R. A. McGinty, Acting Director.*

"Studies in Tolerance of New England Forest Trees, XII. Effect of Thinning in Plantations on Some of the Physical Factors of the Site and on the Development of Young Northern White Pine (Pinus strobus L.) and Scotch Pine (Pinus silvestris L.)," Agr. Exp. Sta., Burlington, Vt., Bul. 390, *June* 1935, *W. R. Adams.*

"The Digestibility of Artificially Dried Roughages," Agr. Exp. Sta., Burlington, Vt., Bul. 400, *Nov.* 1935, *J. A. Newlander.*

"Studies of Ripening of Sugarcane in Louisiana and of Effect of Topping upon Yields of Cane and Sugar per Acre," U. S. D. A., Washington, D. C., Cir. 368, *Oct.* 1935, *George Arceneaux.*

"A Practical Laboratory Method of Making Thin Cross Sections of Fibers," U. S. D. A.,

Washington, D. C., Cir. 378, Nov. 1935, J. I. Hardy.

"Reducing Decay in Citrus Fruits with Borax," U. S. D. A., Washington, D. C., Tech. Bul. 488, Oct. 1935, J. R. Winston.

"Alfalfa Experiments at Stoneville, Mississippi," U. S. D. A., Washington, D. C., Tech. Bul. 495, Sept. 1935, Paul R. Henson and H. L. Westover.

Economics

Results of a thorough study of cost records on 40 farms for the years 1931 and 1932 in La Crosse county, Wisconsin, are interpreted in the Wisconsin Agricultural Experiment Station Bulletin 431 entitled, "How Farmers Adjust When Prices Fall," by D. R. Mitchell. The publication gives an excellent presentation of many significant facts uncovered by these economic investigations.

When farmers decrease their production of crops or livestock, they increase their investment costs per unit of product produced, as a smaller number of units must then carry as large an expense load as before. This is due to the farm investment costs, depreciation, repairs, taxes, and insurance, which comprise about two-thirds of all costs. The importance of a knowledge of investment values and requirements of each individual farm is emphasized. Costly mistakes necessarily must be averted; furthermore, farmers should learn to look upon investments as purchases of future income, the author suggests. The report concludes that some cost adjustments increased efficiency of operations, while other cost reductions are expressed as undesirable. An improvement in efficient feeding of livestock and increase in farm labor efficiency are termed as significant. While short-time reductions in expenditures for commercial fertilizer, cow-testing, and veterinary services generally did not reflect on immediate crop yields and livestock production, a prolonged curtailment of these reductions would mean reduced efficiency in the farm programs.

The bulletin states, "When prices of milk and many other farm products touched bottom as they did in 1931 and 1932, farmers were forced to reorganize their business on a lower cost basis. They soon discovered that many of their costs could not be reduced, and that in the case of others, it was a real problem to distinguish between what constituted a real and a false saving."

The principles of sound business management derived from the studies reported in this bulletin will apply equally well to other farms.

"Agricultural Research for the Alabama Farmer," Agr. Exp. Sta., Auburn, Ala., Sp. Cir., Apr. 1935, M. J. Funchess, Director.

"The Production-Consumption Balance of Agricultural Products In Michigan. Part 1. Fruits and Vegetables," Agr. Exp. Sta., East Lansing, Mich., Sp. Bul. 263, Oct. 1935, G. N. Motts.

"Factors Affecting Farm Land Values in Missouri (From an Appraisal Viewpoint)," Agr. Exp. Sta., Columbia, Mo., Res. Bul. 229, Sept. 1935, Conrad H. Hammar.

"Readjusting Montana's Agriculture. (1. The Need and Basis for Readjustment)," Agr. Exp. Sta., Bozeman, Mont., Bul. 306, Dec. 1935, Roland R. Renne.

"Farm Economics," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., No. 92, Dec. 1935.

"Prices of Vermont Farm Real Estate," Agr. Exp. Sta., Burlington, Vt., Bul. 391, June 1935, T. M. Adams.

"Let me show you something new in a snappy sedan," suggested the salesman.

"It won't do you any good," she replied, "and besides, I don't think you could."

"I see the jury acquitted the girl who killed her employer, on the ground of insanity."

"Yes, and quite right, too. Anybody who kills an employer these days is certainly crazy."

Survey Shows Too Many Fertilizer Grades Sold

MOST farming areas which use large quantities of commercial fertilizer could be supplied by a dozen or so properly selected grades such as 4-8-4, 2-12-6 and others. Yet, farmers as a whole must choose from more than a thousand grades when they buy fertilizer.

Almost 40 per cent of the three and a quarter million tons of fertilizer sold in 1934 was of five popular grades, 3-8-3, 3-8-5, 4-8-4, 2-12-6 and 4-8-7. The remainder, a little more than 60 per cent, was divided among more than 900 grades, according to a joint survey by the Bureau of Chemistry and Soils and The National Fertilizer Association. This information, the investigators say, might well be used as a basis for reducing the number of grades.

Only 21 grades were sold in Mississippi—the smallest number in any state using large quantities of fertilizer —as compared to 425 grades sold in Florida. In Mississippi 85 per cent of the fertilizer was of one grade. In Florida, total sales for each of more than 200 grades were 25 tons or less.

"In most states fertilizer manufacturers are compelled by competition and other circumstances to make and stock many grades," says Dr. W. W. Skinner, assistant chief of the bureau. "Fertilizer bags and tags have to be printed, chemical analyses made, and storage space provided for each grade. The cost of these items is about the same whether 5 or 5,000 tons are sold.

"Farmers can help eliminate many unnecessary grades by finding out the few well-selected grades that will serve their needs. This would help the local fertilizer manufacturer to produce tonnage instead of grades and sell his products for less money."

Results of the joint survey are summarized in a report, Plant Food Consumption in the United States in 1934. Copies may be obtained as long as the supply lasts from the Bureau of Chemistry and Soils, Washington, D. C.

Sixty-six Million in Smokes

WHILE "cigarette money" may be small change to the average Canadian, the amount spent on tobacco in the Dominion as a whole during a year is a very substantial sum and supports an industry of major importance. According to a report issued by the Dominion Bureau of Statistics, the output of the Canadian tobacco manufacturing industry in 1934, including excise duties, was valued at $66,400,493, which represents an increase of $2,165,734, or about 3.4 per cent, over that of the previous year. Cigarettes formed the main item of production with an output of 4,843,470 thousand valued at $38,182,600. Smoking tobacco was next in importance with an output of 19,916,321 pounds valued at $19,939,514. This was followed by cigars with a production of 116,858 thousand valued at $4,557,959; chewing tobacco, 3,118,235 pounds valued at $2,642,751, and snuff, 788,913 pounds valued at $1,063,449.

Tobacco has been grown in Canada since the early French colonial days. At that time tobacco smoking was general among the natives, but the white people did not acquire the habit quickly as the use of tobacco was

frowned upon in the best circles. Due to public sentiment and governmental opposition some time passed before the farmers began to grow the plant. It was not until 1735 that the government gave any encouragement to tobacco growing. Times have changed since then and today the tobacco industry contributes materially to the agricultural economy of the Dominion. Materials used in the industry in 1934 had a value of $18,629,615, of which $14,164,681 was for raw leaf tobacco. All told, the industry consumed 36,100,480 pounds of raw leaf tobacco, of which 26,927,337 pounds with a cost value of $7,521,936 were of domestic origin. During the year under review there were 127 establishments engaged in the tobacco industry, representing a capital investment of $51,546,009 and providing employment for 8,150 workers. The value of production, less excise duties, is placed at $37,489,025.

Vegetation Is to the Soil What Skin Is to the Body

VEGETATION on the earth is likened to the skin on our bodies by Federal erosion-prevention workers. Remove a large portion of the skin and terrible sores result. Reckless denuding of millions of acres of the richest land in the country has resulted in erosion; huge sores upon the earth.

"Recovery from the disease of erosion is not a simple matter," says H. H. Bennett, of the Soil Conservation Service. "Obviously we cannot return to presettlement conditions. The nation has its roots in agriculture and if the nation is to continue, agriculture must continue. We cannot raise corn and tobacco and cotton in the woods. We cannot harvest a wheat crop from the unbroken prairie. But we must make some concessions to nature, whose laws we cannot repeal even if they are irksome.

"Protection and production are not necessarily incompatible. With a system of correct land use we can farm much of our soil and keep it, too. We cannot safely farm all of it to clean-tilled, erosion-producing crops. Some of the steeper and more erosive land must be in trees or grass. These crops anchor the soil. Like the skin on our bodies they protect the earth from the disease of erosion."

Fertilizing Pennsylvania Cigar-leaf Tobacco

(*From page* 12)

of disease organisms. This is a factor of great importance; in many cases, entire crops have been destroyed by disease. Heavy rains reduce the vitality of the plant, rendering it more susceptible to leaf-spot diseases, especially wildfire, unless the plant is fortified with potash. In addition, no element surpasses potassium in enhancing the burning quality of tobacco.

The soils of Lancaster county lack available potash. During the season of

1935 crops were observed which showed pronounced symptoms of potash deficiency in the early stages of plant growth, as evidenced by the characteristic mottled appearance of the leaves. Later, an unbalanced condition with respect to nitrogen and potash was observed in many mature plants throughout the county, as evidenced by the characteristic "stem-bound" condition of the leaf. Such a leaf is thicker than a normal leaf and contains more organic matter in proportion to the quantity of potash. This is undesirable from the standpoint of the manufacturer, since it is difficult, if not impossible, to "ferment" smoking qualities into such tobacco.

The problem of potash fertilization is of paramount importance to the tobacco industry of Lancaster county. Notwithstanding the fact that these tobacco soils are deficient in available potash, little potash fertilizer has been used, on some farms none at all. In many cases, fertilizers which are not well balanced with respect to nitrogen, phosphoric acid, and potash have been used. More attention appears to have been given to additions of nitrogen than to additions of either phosphoric acid or potash. This practice must be changed, if the tobacco industry of Lancaster county is to be profitable.

It is difficult, if not impossible, to recommend a fertilizer mixture that will satisfy all conditions in Lancaster county. The field experiments, however, have yielded results which are applicable, in large measure at least, to other parts of the county as well. An application of 1,000 pounds, or more, of commercial fertilizers per acre is desirable in all cases, but the units of nitrogen, phosphoric acid, and potash may vary to some extent on different soils. The nitrogen may vary from 3 to 6 per cent, the phosphoric acid from 5 to 8 per cent, while the potash may vary from 10 to 12 per cent. Potash should be the predominating element. It must be used in a form other than the muriate. The phosphoric acid content should be, on the average, somewhat greater than that of nitrogen.

Excellent results have been obtained on the experiment plot soils, from the standpoint of both yield and quality, when a 6-8-12 mixture has been applied broadcast or to the row in quantities varying from 1,000 to 1,500 pounds per acre, and without manure. Satisfactory results likewise have been obtained on the plots and on different farms located throughout the county when either a 3-5-12 or a 3-8-12 mixture in like quantities has been used in conjunction with stable manure.

The Inquiring Mind

(*From page* 22)

ually changed by soil organisms to nitrates or ammonia, in which forms nitrogen may be taken up by the plants. Some soils produce good crops for a long time without additions of vegetable matter, but for permanent productiveness on most soils, vegetable matter must be added sooner or later. Vegetable matter may be supplied from barnyard manure, from leaves, straw, or similar waste material, or from legume crops which have power to take nitrogen from the air.

Legume crops may be grown in rotation with other crops, and if either grazed off or turned under will introduce vegetable matter into the soil. If the crop is heavy, it is best to allow it to become nearly mature before turning it under. To graze off the crop is better than to turn it under, as some of the feeding value of the crop is secured when it is grazed,

while the droppings of the animals, together with the liquid excrement, return to the soil the bulk of the plant food taken away by the crop. When the legume is made into hay to be sold, however, the land probably gains little nitrogen and actually loses phosphoric acid and potash.

Many of the Texas soils are rich in potash, but there is a variation among the different types and some need potash as a fertilizer. While in many cases the total potash is high, a large part of this is locked up in insoluble silicates and may not become available for the use of plants in centuries. The total amount does not, therefore, indicate how much is available for use by the immediate crop, and potash must often be added in the form of commercial fertilizer.

A Sound Adviser

All of Dr. Fraps' published articles and bulletins concerning fertilizers contain the same sound advice, and we are certain that such recommendations have, and will do, a great deal toward improving the fertility of Texas lands.

As stated previously, in his address to the Texas Feed Manufacturers in 1935, Dr. Fraps recommended the establishment of rigid standards for mixed feeds. The adoption of such measures will do a great deal for Texas, and Dr. Fraps is to be commended for his work in determining scientific and balanced rations. For more than 100 years chemists, biologists, and other research workers have been studying to find out what ingredients are necessary and how great are the requirements to produce the best results in the feeding of domestic animals.

A great deal has been discovered, and a great deal remains to be done; but the proper use of the information already available, the proper compounding of feeds that will adequately serve the needs of domestic animals and manufacturing and selling under strict laws will be of great benefit to the users. A portion of the energy in the feed eaten by the animal passes through in the undigested compounds found in the solid and in the liquid excrement. Some energy is lost in fermentation in the intestines, and a portion is consumed by the work of digestion. The net energy-producing feed which remains is the part which can be used for the maintenance of the animal, repair of the animal body, and for the production of fat, milk, eggs, work or motion.

It is important, therefore, that feeds sold should be properly made and compounded to produce the greatest amount of energy and body-building ingredients, and Dr. Fraps' research and his published findings will be of great benefit in establishing correct grades and suitable laws for the sale of feeding stuffs.

Interested In Many Projects

These are just a few of the projects which have made Dr. Fraps' name so well known in the field of agricultural chemistry. In addition to his soil and feeding research, he has found time to give a great deal of time to other agricultural needs. He has published bulletins on "The Composition of Rice By-Products" (1904); "The Chemical Composition of the Cotton Plant" (1919); bulletins dealing with wheat, peanuts, corn, cottonseed meal, oats and oat by-products, prices of feed utilities, digestibility and production coefficients of poultry feeds, and hundreds of other interesting and instructive offerings.

Professor A. D. Jackson, editor of publications at the Texas Experiment Station, says, "For more than 15 years Dr. Fraps has taken a vigorous part in the editing of all the publications of the Texas Station. His wide knowledge of the current status of the scientific progress in all branches and his practical understanding of the elements of correct publications have

enabled him to be of great assistance to authors, especially to young authors, and his advice is universally sought by all members of the staff, numbering at present around 125.

"As chief of the Division of Chemistry of the Station, his work touches vitally that of all the other divisions. Dr. Fraps is either author or joint author of a large proportion of the nearly 600 publications issued by the Texas Station, as well as a large number of articles published in scientific journals. His studies of the composition of the soils of Texas and his administration of the Texas fertilizer laws have enabled him to render invaluable service to farmers seeking to make an intelligent use of their lands and of the fertilizers required for the best performance of the land.

"His studies of Texas feeding stuffs and their composition and utilization have led to a more correct evaluation of various feeds and their productive value. His work in this field ranks with that of the greatest students in the world dealing with feeding stuffs. His publications dealing with feeds are the handbooks of feeders, and serve as a guide in the establishment of standards required in the Texas feed-control service.

"The intimate ramifications of chemistry into all of the problems of agriculture have called forth unusual activity on the part of this great chemist and the large and competent staff which he directs. He finds time to advise many students each year in their studies at the Texas college, although he has not attempted to do any regular teaching for many years. His personal and official mail is large in volume and always receives his most careful attention, and his replies are always considered absolute."

Enjoys Social Activities

A tribute such as this gives a fine impression of the character and ability of the man. Dr. Fraps still finds time to take a fairly active part in the social activities of the campus. The family maintains its membership in the Episcopal Church, where it is active and liberally contributes to its support.

Dr. Fraps is active in the meetings and scientific work of the many societies of which he is a member. He has paid small attention to the matter of amassing money and lives modestly, but in his hospitable home visitors feel an unusual freedom. In his gardens he has developed a number of fine roses, and some of the finest and rarest specimens may be seen there. And, as we said in the beginning, he is an ardent radio fan, and spends a great deal of his spare time listening. To again quote the great Major Bowles, and we hope Dr. Fraps is listening, "All right, all right, with a record like yours will wil never get the gong."

Fertilize to Control Cotton Wilt and Rust

(*From page* 16)

From the point of view of the control of the cotton wilt disease, the striking result is the very pronounced effect of high-potash fertilizers in very greatly reducing the incidence of cotton wilt—even as little as 40 pounds of muriate of potash per acre in a 4-10-4 fertilizer resulted in a reduction in the incidence of cotton wilt from about 37 per cent to about 20 per cent, and an application of 144 pounds of muriate of potash alone resulted in a decrease to less than 7 per cent. The application of 300 pounds of superphosphate alone actually

EFFECT OF VARIOUS FERTILIZERS ON THE INCIDENCE OF COTTON WILT AND YIELD OF SEED COTTON, COTTON BRANCH EXPERIMENT STATION, LEE COUNTY, ARKANSAS, 1933. (EACH TREATMENT WAS REPEATED FOUR TIMES IN THE EXPERIMENTAL FIELDS.) VARIETY TRICE 304.*

Plot Treatment		Percentage of Wilted Plants					Acre Yield of
Formula	Amount Applied to the Acre	July 5	July 20	Aug. 5	Aug. 20	Sept. 5	Seed Cotton
							Pounds
Check	No fertilizer	4.0	10.5	13.3	20.6	37.2	644
6-0-0	Nitrate of soda, 240 lbs.	2.1	7.0	9.7	17.9	31.8	1,123
6-8-0	Nitrate of soda, 240 lbs. Superphosphate, 300 lbs.	2.8	6.2	12.4	22.2	37.2	994
6-8-6	Nitrate of soda, 240 lbs. Superphosphate, 300 lbs. Muriate of potash, 72 lbs.	.8	2.8	4.5	8.2	13.3	1,665
6-8-12	Nitrate of soda, 240 lbs. Superphosphate, 300 lbs. Muriate of potash, 144 lbs.	.9	4.1	5.3	7.0	8.1	1,813
Check	No fertilizer	4.4	7.4	10.5	16.3	28.2	692
4-10-4	Nitrate of soda, 133 lbs. Superphosphate, 313 lbs. Muriate of potash, 40 lbs.	1.5	4.2	6.7	10.2	20.1	1,344
0-0-12	Kainit, 15 percent, 480 lbs.	.8	3.1	5.6	6.5	8.5	1,075
0-0-12	Muriate of potash, 144 lbs.	1.1	3.9	5.1	6.0	6.9	1,138
0-8-0	Superphosphate, 300 lbs.	5.9	12.7	16.5	23.9	40.1	672
Check	No fertilizer	6.1	14.0	16.8	23.2	37.6	643
	Manure, 10 tons	3.2	10.4	11.2	15.0	18.9	1,624

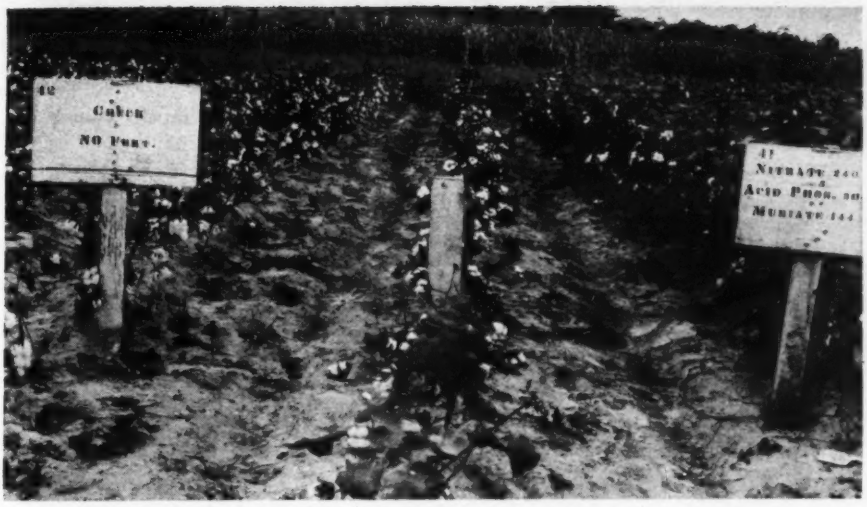
* This table is reproduced from Arkansas Agricultural Experiment Station Bulletin 308.

seemed to increase the incidence of both rust and the cotton wilt disease.

The numerical data shown do not tell the whole story, since the incidence of rust or potash hunger cannot easily be expressed in figures except as it is expressed in yields. Very pronounced control of this trouble was obtained through the use of potash-containing fertilizers, including manure, and was evidenced by the absence of all the typical symptoms of the disease. On the other hand, it is interesting to note that in this experiment, as well as in practically all others where nitrogen and phosphorus were applied alone or in combination, but without potash, the symptoms of potash hunger were actually even more striking than on non-fertilized plots, and in practically every case the incidence of cotton wilt remained as high as though no fertilizer were used.

In another series of experiments extending over a three-year period, it was found that cottonseed meal equivalent to that contained in 600 pounds of a 6-8-6 fertilizer applied just prior to planting, gave only small yield increases and had almost no effect on the amount of rust or wilt.

From the practical point of view, a series of later experiments similar to the 1933 experiment mentioned above, but in which half of each series of treatments was planted to Misdell 2 (a highly wilt-suspectible variety) and half to Rowden 2,088 (a moderately resistant variety) indicates that cotton wilt and rust can be almost completely eliminated, provided root-knot is absent, if a resistant variety is em-



Showing the effect of a complete fertilizer (600 lbs. of 6-8-12) versus no fertilizer on cotton wilt and "rust." Note premature defoliation and poor growth in the no-potash plot. There was about three times as much wilt in the no-potash plots as on the fertilized plots and the yield of seed cotton was about one half as great.

ployed, and enough potash is applied to control rust or potash hunger.

The results from this series of experiments lead us to the conclusions regarding the practical control of the cotton wilt—rust—root-knot complex in Arkansas, which are the basis of our present recommendations. In substance they are as follows: We advise our farmers that they must first control root-knot. Fortunately, only a small proportion of them are as yet faced with this problem so far as cotton is concerned. If we are able to

Showing the effect of potash fertilizer alone versus phosphate alone on the incidence of cotton wilt and rust. Note healthy foliage on the potash plot and the defoliation and poor growth on the phosphate plot. The potash plot showed an incidence of 3.88 per cent on the phosphate plot.

eliminate root-knot from consideration, we then turn our attention to rust or potash hunger. If it is present, we recommend its control through adequate potash fertilization and the building up of the humus of the soil. Finally, with these two phases of the problem under control, we recommend not necessarily the most wilt-resistant variety of cotton available, but rather at least a moderately resistant variety which best suits the general situation. Under our conditions these recommendations have never failed to give satisfactory commercial control. We make no such recommendations for any parts of the State except those sandy, alluvial lands where our experiments have been tried and where they have been remarkably successful.

We believe that there are many other parts of the South where such a program will succeed; indeed, recent reports from both the Mississippi and Tennessee Experiment Stations indicate that their results with potash-containing fertilizers for the control of cotton wilt are substantially in accord with those secured by the Arkansas Station. However, actual experience in the particular locality under consideration will be the only safe guide for the individual cotton farmer.

Meeting New Hampshire's Pasture Problem

(*From page* 19)

and Japanese millet or Japanese millet and Sudan grass for August have been most useful. Reseeding the run-out areas in pastures that are tillable also has been advocated.

These have been the planks in our Extension platform in New Hampshire. As I have already indicated, a recent check-up was made by County Agents to determine how far we had gone along the road of pasture improvement and management. The results for those dividing their pastures have already been given, and there was no small amount of surprise when we found that 43 per cent of the dairymen who replied to the questionnaire had practised some method of dividing their pastures.

It should be stated also that answers came from but about 10 per cent of the dairymen of New Hampshire. Those who threw the letter up on top of the kitchen clock and forgot about it are not included in the summary. It may be true that only the better farmers answer questions like this, but after two decades spent in work of this sort we suspect that a great many good farmers laid the letter aside until they had more time to answer it or filed it in the waste-basket when it came. To get an estimate of progress, perhaps we should multiply the information by three or four or five. But that would still be an estimate, and so we will confine our story on progress made to the reports of those who actually did send back the information; then we will know what happened on these farms, anyway.

Fourteen hundred and twenty-four acres of pasture were top-dressed by farmers reporting. This does not mean that every dairyman fertilized an acre of pasture. Some men did nothing, while others fertilized on rather a large scale, one large herd owner reporting a total of 60 acres so treated.

The top-dressing idea is gaining ground. Farmers have been somewhat skeptical about treating some of their old pastures, fearing that they will not get value received for the money spent. There is a dividing line, and it takes some experience to know what

kind of pasture will and will not pay. When the facts are better known, and money gets a shade more plentiful, this phase of the program will go forward more rapidly. There is plenty of interest now. All that is needed is courage to make progress.

A Few Simple Rules

Much experimental work has now been done in the Northeastern states on pasture fertilization. The conclusions that have been drawn from this work are so impressive and clear-cut that there is little need for making mistakes when undertaking a top-dressing scheme.

A few simple rules about where and how to begin and what to use may not be out of place.

(1) The best areas in the pasture should be top-dressed first. Top-dress the best sections at the start, for all of the pasture area will not be needed when it responds to fertilizers.

(2) Top-dressings should be applied from two to eight weeks before grazing is to begin, depending upon the nitrogen carrier used.

(3) An application of 500 to 600 pounds of a 4-8-7 or 4-8-8 or other analyses in this ratio will usually prove ample in amount at the start. If double strength fertilizers are used, the rate of application should be reduced so as to apply the equivalent amounts of plant food. This will stimulate the grass for early grazing and will encourage White Dutch clover which will be productive during the summer and fall months, provided the soil is heavy enough to support a stand of Dutch clover. It should be, if the most profits are to be obtained from top-dressing.

(4) On better sods and in more intensive systems of dairying, a 1-1-1 ratio may be used in place of the 1-2-2 ratio mentioned. This will give more early stimulation and, if used, should be followed by heavy and controlled grazing.

(5) In fact, any system of fertilization should be coordinated with proper fencing so as to control the grazing. Less fertilizer need be applied if this is done, and the fertilized areas will not be injured by too close cropping if grazing can be controlled.

(6) Lime may be applied at any time at the rate of ½ to 1½ tons ground limestone or ½ to 1 ton hydrated lime per acre. If a farmer's money is limited, he should fertilize first and lime after he has had some profit from the top-dressing. In any event liming should not be delayed too long, as fertilizing may increase the need for it.

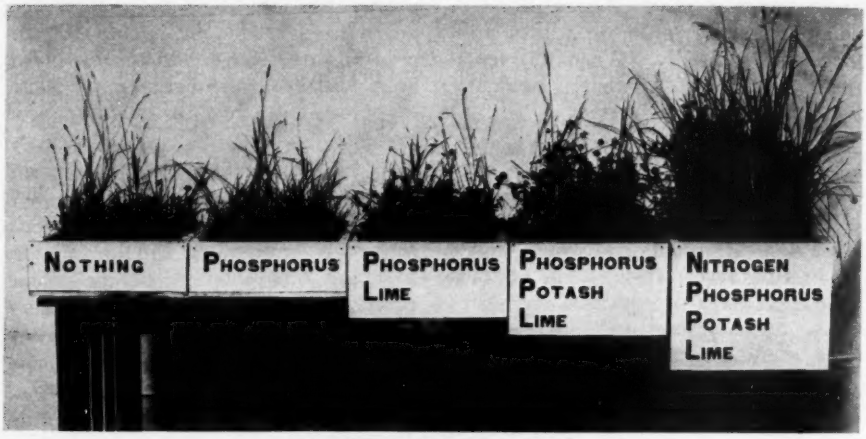
What results may be expected from top-dressing planned out along these lines? The National Fertilizer Association published the results of 103 carefully conducted trials in 1929, indicating that a sod yielding about ½ ton of dry matter could be reasonably fertilized and made to produce 1¼ tons of dry matter per acre during the pasture season. Protein was increased from 171 to 488 pounds per acre, a somewhat greater ratio because the protein of fertilized grass is higher than that not treated.

In 1930 these same investigators, in cooperation with farmers in nine Northeastern states, reported a profit of $29.62 an acre from top-dressing where the work was carried out on a field scale and the results checked in actual milk produced.

Top-Dressing Pays Profits

In our trials in New Hampshire we have produced feed, by top-dressing in the pasture with fertilizer, much cheaper than we could buy the same amount of feed at the grain store. In fact, we secured from 2 to 11 times as much feed with our money invested in fertilizers, carefully applied, on reasonably good sods, as we would have had we taken the same amount of money to the grain store and spent it there.

103 PASTURE TOP-DRESSING TESTS IN 15 STATES AND THE PROVINCE OF ONTARIO IN 1929 GAVE THE FOLLOWING AVERAGE YIELDS:



Pounds Dry Matter Per Acre				
1,051	1,392	1,548	1,850	2,501
Pounds Crude Protein Per Acre				
171	235	266	344	488

There are very few farmers in New England, and perhaps in the Northeast, who cannot afford to top-dress some pasture land. Fertilized pastures are profitable because of the response obtained. They save buying grain, reduce the necessity for feeding so much hay and silage and green feed in the barn, reduce the labor necessary in caring for the herd, increase the palatability of the pasturage, boost its mineral content; in short, they make dairying easier and keep more of the money at home.

Even with properly fertilized pastures it will still be necessary for most farmers to grow some emergency crops for late July and August.

Emergency pasture crops utilized on the farms reporting total almost 2,000 acres. The crops utilized were oats and Japanese millet. A few years ago no one had thought of pasturing oats. One farmer alone last season fed off 50 acres of oats on his Connecticut valley farm and states that he will never return to the old method of haying the oats, and meanwhile, feeding his cows in the barn during July and August. Pasturing the oats means better stands of clover than where the oats are mowed for hay. This fact is now conceded by those who have tried the system. Better hay crops following will tend to make up for the lack of cured fodder in the barn by not harvesting the oats, and the most difficult part of haying is eliminated when the oats crop is turned over to the cows.

One question asked was in regard to the number of acres of rowen pastured after early haying and after top-dressing hay land in the spring. This method of increasing August and September pasture has an extremely wide appeal, for 7,265 acres of second crop were utilized in this manner.

One reason this question was asked was because we had staged a rather active campaign in the winter of 1935 to influence farmers to use chemical fertilizers on thin hay land, to increase the yield and quality of the hay, as well as to give better rowen crops. The farmers who reported indicated that they top-dressed 3,495 acres of hay in 1935 as against 1,580 acres in 1934, which accounts to some extent for the wide utilization of the second crop for pasture.

On the farms reporting, there are more than 5,000 acres of tillable pasture. Approximately 10 per cent of

this was plowed and reseeded to a permanent pasture mixture during the year. If every farm had an equal acreage of tillable pasture, the matter of pasture improvement would be quickly solved, but it hasn't been distributed in this manner.

No data are available on cutting brush, renovating cut-over land, or other means of improving grazing land. We are aware of the fact that there is an increasing effort in this direction, particularly in the removal of hard hack and other brush and weeds from desirable pasture lands.

It appears too early yet to predict when all the farmers who care to will have available pasture all through the summer season. Progress has been made. Many farmers have already achieved the goal for their individual farms. The stage is set for a violent offensive, and that there are plenty of campaigners no one can deny.

Soybean Trends

(*From page 8*)

into five divisions and the average yield for each division determined, a more complete picture of what has happened may be obtained. The results of these calculations are given in the accompanying diagram.

The trend of the yields for the unfertilized plots has been downward from 17.6 bushels per acre for the first division (1912-15) to 9.6 bushels for the last division (1929-32). All the fertilizer and manure-treated plots increased the yield over the untreated plots in each division, but the general trend of the yield also has been downward. This indicates that the soybean crop was removing more plant food from the soil than was returned by applications of manure or fertilizer, and that the crop was drawing upon the plant-food reserves of the soil.

It will be noted in the table of treatments that the plots received about three times as much plant food during the first three divisions as they did during the last two divisions. Considering the first three divisions alone, where the larger amounts of plant food were returned, it will be observed that the trend of the yields was downward from the first division to the third division. Where the smaller amounts of plant food were returned to the soil during the last two divisions, the yield of soybeans has gone down until the highest yield from the fertilized plots in the fifth division was only 2.4 bushels above the yield of the unfertilized plots of the first division and nine bushels below the highest yields of the treated plots of the first division. Examining the diagram still further one observes that muriate of potash alone has not sustained the yields as well as a combination of superphosphate and muriate of potash or nitrate of soda, superphosphate, and muriate of potash or manure.

The amounts of fertilizer and manure that were applied to these plots per rotation were thought to be large at the time the plots were laid out, and yet the return of 16 pounds of nitrogen, 40 pounds of phosphoric acid, and 37 pounds of potash on the NPK plot or the return of approximately 50 pounds of nitrogen, 25 pounds of phosphoric acid, and 50 pounds of potash on the manure plot for each soybean crop removed during the first three divisions (1912-1924) has not prevented the yields from taking a downward trend. Where the amount of plant food returned was reduced to about one third of the above amounts, as it was in the fourth and fifth divisions, there has been a further decline in the yield until the yields of

the treated plots of the fifth division approximate the yields of the untreated plots of the first division.

Analyses of the fertilizer constituents in the soybean crops that were removed are not available, but if the analysis of the fertilizer constituents in a crop of soybeans, as given by Smith and Woods, is compared with the amount of fertilizer materials returned to the soil on the Delaware treated plots, the calculations will show that for the 21-year period there have been removed 1,050 pounds of nitrogen, 840 pounds of phosphoric acid, and 2,100 pounds of potash by the cropping of soybeans, and that there has been allotted for this removal a return of 128 pounds of nitrogen, 616 pounds of phosphoric acid, and 559 pounds of potash on the NPK plot. These calculations show that the soil book has not been balanced. The trend of the yields indicate the same thing. Will the future grower of soybeans accept a decreasing yield or will he be returning to the soil 500 to 1,000 pounds per acre of a 5-5-10 fertilizer or the equivalent?

Richer Dirt

(*From page 5*)

career of food expansion is about over, both as to foreign outlets and domestic consumption—under our present general consumers' wage scale.

Not in terms of stomach capacity or fulfilled desires, but in terms of old technocracy, the machine age and jobs and buying power. It's more than a fence-line, quarter-section question, despite the court's decree to the contrary. Why, it's even beyond Walter Winchell!

You and I can't get up any heated argument over the common sense involved in the soil program or better farming which accompanies it. There isn't any between trained friends on that score.

Erosion is wrong, wasteful, hateful, ugly, and a dirty discredit to us. Wire grass and tumble weeds should give ground to legumes. The torrential rains we get in the Mississippi valley area, followed by heat waves of blistering severity, burn up the soil chemicals faster than biology can function to restore fertility. (That's another place where Europe has it "on us." They don't get such extremes to oxidize the wealth of organic matter.) Green manuring for humus and nitrogen is a greater gospel than the dictums of the Supreme Court, and mending our miserable runaway lands means more than amending the Constitution.

There is no turning back, no chance for debate when it comes to that issue. Any other course is defeatism.

So bring on your limestone, your cultures, and your minerals to aid the bacterial symbiotic processes at the roots of lupines, lespedeza, and lucerne. Get it by grants or tackle it with taxes—only get it done! Then what?

It's just what we know should be done and what should have been done years ago, if we had had the cash and the conviction. So it's all to the good —amen from all corners! And yet?

Project yourself into the future. Here's a lush field of legumes, the ideal of anybody's ruminants. It grows on a third of the crop land worth cropping in America. Cut it for hay, and the tonnage of rank, leafy, vitamin-filled, high-protein forage bursts the nation's mows and even crams the silos! But I can't eat any of it. It's a juicy job for the critters —meaning more critters, more milk, wool, pork, and beef.

Use it for pasture, and the lambs and piglets wax fat and more numer-

ous. Again the farmer finds his carrying capacity far ahead of his herd, and he breeds some more. If our consumers earn enough to keep step, we will be in clover in more ways than one. Here's hoping for an industrial renaissance to match the coming soil renovation!

BUT that's not the whole story. Here's another field of legumes, ripe and well established. Humus is lacking in the soil. Turn under the whole plant, start the nitrogen factory working, aerate the soil, stop leaching and baking; then rotate with cereals, cotton, corn, tobacco, cabbages, and even artichokes if you like them. How much more of these cash crops will one acre thus improved over four or five years bring forth?

Plenty is the answer—plenty! We only hope it won't be the tortured plenty we had in 1932, which sent us to the purple bow-wows. Again we turn our sweaty eyes to behold the road over which those better paid and more numerous and ravenous cash customers must come to glean what we have provided at a goodly stipend. But unfortunately, we have been so all-fired busy in the corn rows and the pumpkin vines that we could not spare time to regulate the production of the tycoons of industry; and to them we must look for succor or else again be suckers.

Somehow, by these devious meanderings I have come to adopt the hunch that this whole mess is, after all, a national problem at least. I know some jurists do not agree, but I was always a stubborn cuss, and one devoid of precedent. It is not a case of "cheap food" for the masses, but one of plenty of food at prices which do not put eternal mortgages on the soil. If the soil is worth saving, by gracious, it is worth redeeming by decent installments to the husbandmen. Otherwise, sooner or later we don't eat.

Of course, there is one flaw, and a big one at that, in my little thesis. I have inferred that the "Guv'munt" could induce practically all farmers to become efficient farmers—and thereby ruin the business for the whole kaboodle. But it won't happen.

There must always be a residue at the bottom of the kettle out of which to make good, thick, pasty political soup. I don't know what would happen to campaign orators without an issue, in case this incorrigible group of non-conformists suddenly took the government seriously and began soil improvement simultaneously.

Then there is always a fringe of individualists who subscribe to day-old metropolitan newspapers, calling themselves the "world's greatest." They delight in seeing farm leaders damned by two-bit scribes or distorted by subsidized cartoonists, all in the interest of low-cost loins and high-cost dividends. You can bank on those boys hanging onto gullies and marsh hay for a couple of centuries, or until the sheriff pushes them off so the insurance company can speed the plow. They swallow the "con" handed to them and are proud to be con-servatives ne plus ultra forever.

Then, arrayed on the side of delay in reaching the ultimate in agricultural efficiency are the many pests not heretofore mentioned—the bugs and the bad bacteria. There's many a slip between twenty pounds of scarified seed and an acre of legumes, not to mention the gibbering "Gibberella," or whatever it is that haunts the springtime corn fields, lying in wait to nip the germ in the bud.

SO we can thank our stars for weather vagaries and human frailty. It's about the only antidote we have in our purposeful pledge to make America "soil conscious." We can depend on the floods and the drought and the sulkers and the kickers to keep us prosperous in the minority—simply by not doing the right thing by the land. The fellows who built the poor-houses knew human nature

pretty well, I reckon. They knew we wouldn't all have sense enough to become prosperous at the same time. Not even when we pay taxes to hire folks to teach us how to get that way.

By degrees, prior to the fateful January sixth, we had been edging away from the old philosophy of scarcity in farm production, always rankly distasteful to men of the land. It has not been so horrid to other gainful enterprises in America, and the old law of S. and D. was erected on that sacred precept. Yet in spite of that, we rural fellows sort of apologized for copying the tricks of the traders when we held a few of their trumps ourselves in 1933 and 1934. They couldn't take it like we took it, and so the game ended—to be resumed directly in a different room with a new deck.

Now the gratifying thing to me lies in that when we begin this game of old sledge-hammer again, after Congress finishes its frothing, we will have with us a corps of experienced players who refused to "sit in" on the *contract* game. They were used to auction or something else. They hated "reduction and scarcity," and wanted "efficiency and progress" to have a big hand in solving the riddle. Some of them were great old agrarians too, robust and courageous—just as "sold" on a national farm policy as the rest of us.

TO them the soil improvement idea is a godsend. It enables them to grab their overalls and pitchforks and holler for belt grease and spliced rope. Most of these old-timers are to be trusted throughout the coming tussle, and because they can see daylight ahead and a chance to create plenty instead of less, they are as enthusiastic as we are—maybe a shade more so, to be frank.

We can excuse some of them because they are not economists. I don't know just how much we are going to need the economists in soil mapping and seed testing, but we better ship a few of them in case we sight a school of sharks again. As for the lawyers, well, we still have the agreements! That is, for the time being, as long as cases can be postponed. But without contracts per se, I see little vital need for so much legality. We might as well get bumped for too much as for too little infringement. And minus the lawyers we would have the plea of ignorance to soften the sentence, although we'd hate to admit it.

OF course, there yet remains outside the pale of our new hegira the lost tribe of dairymen, the never-satisfied, restless yearners for satisfaction and justice. They are dumbfounded one way and damned the other way. I wish we might enlist their power and vigilance in a good cause. But they prefer to shadow-box and burn straw men, choose to hunt for goblins and search for scarecrows. Reduction burned them up in a couple of directions, and soil rejuvenation in wholesale fashion finds them hostile and haggard. Mayhap by pressing on along an independent route, the milkers may discover and meet the hordes of longed-for ultimate consumers, to whose coming under higher living standards we all look for the justification of farm progress. The original dairymen were roaming, pastoral independents, and so they remain today. Selah!

And so, as the heaping snows melt and move away the top soil, and the mystic alchemy of nature renews its ceaseless summer wasting and restoring, let's be up and doing anyhow; for it's mostly an educative process as of old. Forget the mistakes of the past and scorn the muck they slather at us during the campaign to come.

Theirs may be a period of mud slinging, but ours will be a permanent piece of soil building. When *we* call for *more and richer dirt,* even the lilies of the field look up and smile!

★

The old, mistaken belief that soils contained plenty of potash which could be made available by proper farming methods, has now been definitely discarded. What potash there *is* in most soils is so tightly locked up that plants cannot obtain it in amounts sufficient for good growth, therefore a generous application of potash is highly essential.

★

MANURE SALTS

MURIATE of POTASH

Both 50% and 60% Grades

POTASH COMPANY OF AMERICA

Baltimore Maryland

Curious Old Lady: "You've lost your leg, haven't you?"

Cripple (looking down): "Well, damned if I ain't."

Matrimony puts an end to more petting than all the police put together.

EATING PROFITS

"I sent my little boy for two pounds of plums and you only sent a pound and a half."

"My scales are all right, madam. Have you weighed your little boy?"

If your face can't get your picture in the papers, write a patent medicine testimonial; maybe your kidneys will.

A bewildered man entered a ladies' specialty shop. "I want a corset for my wife," he said.

"What bust?" asked the clerk.

"Nothin'. It just wore out."

Usher: "How far down do you want to sit, Madam?"

"Why, all the way, of course."

Father: "Willie, while you were away playing a new sister came."

Willie: "Where did she come from?"

Pa: "Oh, from a land far away."

Willie: "Gawd, another foreigner."

Reno, they say, now claims to be an important factor in the dairy industry. That's where the cream of the country goes to get separated.

NET RETURN

"So you met Alice today?"

"Yes, I hadn't seen her for ten years."

"Has she kept her girlish figure?"

"Kept it? She's doubled it!"

Small Girl Friend (to 8-year-old son of auto salesman): "Oh, I think you're lots better looking than your daddy."

Son: "I ought to be. I'm a later model."

"What kind of a fellow is William?"

"Well, the other night the lights went out in his girl's parlor and he spent the rest of the evening tinkering with the fuses."

FLUCTUATING MARKET

"Does your wife ever brag about you?"

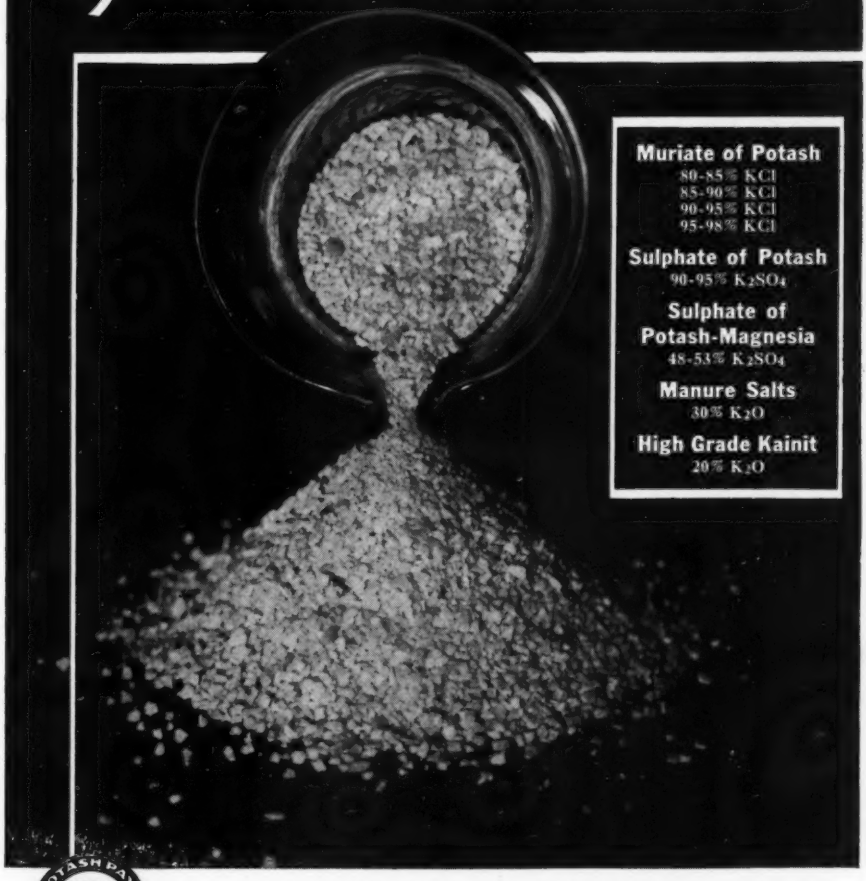
"Oh, sometimes out in company; but she always goes to a lot of trouble to deflate me when I get home."

"Pa," expostulated Granny, on a visit to the city, "the way you stare at them gals legs is scandaleous. Them city folks thinks you'd never seen legs before." "Well, old lady," says Pa, "I wus jist beginnin' to think so myself."

"What is the difference between a model woman and a woman model?"

"One is a bare possibility—the other a naked fact."

IT'S GENUINE NV *Granular* MURIATE



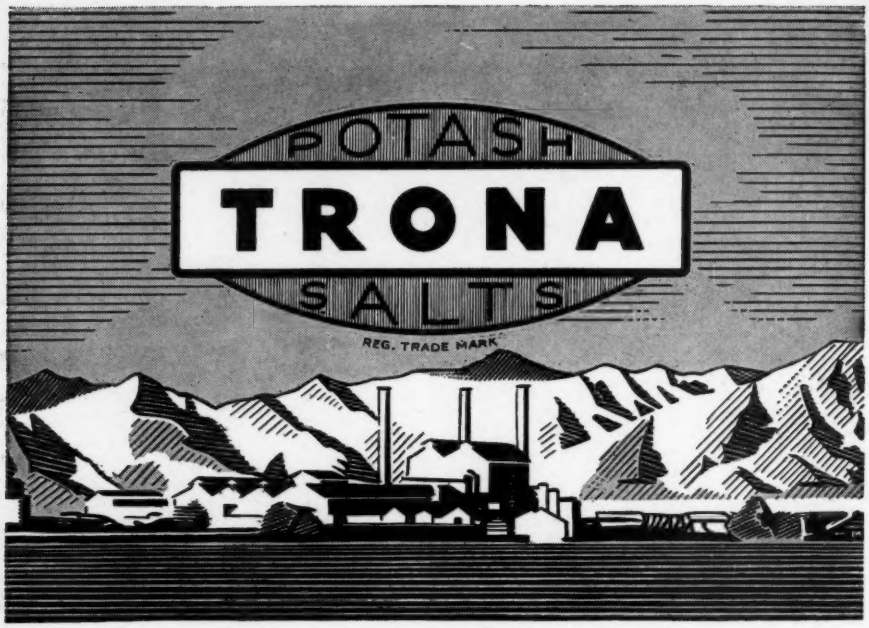
POTASH PAYS ON ALL CROPS

N. V. POTASH EXPORT MY., Inc.

19 West 44th Street, New York

Hurt Building **ATLANTA, GA.** • *Balt. Trust Bldg.* **BALTIMORE, MD.** • *Buckingham Bldg.* **CHICAGO, ILL.**

Agents for Pacific Coast: Wilson and Geo. Meyer & Co., San Francisco, Calif.



Trona on Searles Lake, California

PAY DIRT POTASH

PRODUCED IN TWO GRADES

80/85% KCl

95/98% KCl

American Potash & Chemical Corporation

70 Pine Street New York

Sales Offices

Atlanta, Ga. Baltimore, Md. Columbus, Ohio

PIONEER PRODUCERS OF MURIATE IN AMERICA

Printed in U. S. A.